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Training and Education

THE ARMY DISTRIBUTED LEARNING (DL) GUIDE

FOR THE COMMANDER:

OFFICIAL: MARK MACCARLEY
                                                 Major General, U.S. Army
                                                 Deputy Chief of Staff

CHARLES E. HARRIS, III
Colonel, GS
Deputy Chief of Staff, G-6

History. This publication is a major revision. It supersedes U.S. Army Training and Doctrine Command (TRADOC) pamphlet (TP) 350-70-2, dated 26 June 2003, and TP 350-70-12, dated 29 March 2004. The portions affected by this revision are listed in the summary of change.

Summary. This pamphlet provides managerial guidance on the development of distributed learning (DL) content and courseware; explains the planning, analysis, design, development, and delivery of DL products; and explains the various roles involved in the management of DL development.

Applicability. This pamphlet applies to TRADOC activities and One Army School System training battalions responsible for managing, developing, and implementing learning products. It also applies to non-TRADOC agencies and organizations possessing memoranda of understanding, memoranda of agreement, and contracts for developing learning products for TRADOC and One Army School System agencies and organizations.

Proponent and exception authority. Army Regulation (AR) 350-1 assigns the commanding general, TRADOC the responsibility for Army learning (training and education) guidance and procedures contained herein. The proponents of this pamphlet are the Combined Arms Center

(CAC); Army Training Support Center (ATSC); and TRADOC Capability Manager, The Army Distributed Learning Program (TCM-TADLP). The proponent is the authority to approve exceptions or waivers to this pamphlet consistent with controlling law and regulations, unless otherwise designated. Exceptions are granted on an individual basis. The commander or senior leader of the requesting activity must endorse all waiver requests before forwarding them through higher headquarters to the policy proponent. Requests must include requestor contact information; type of request (initial, extension, modification, appeal, or cancellation); specific line items requested for waiver; unit, institution, or center/school affected; proposed alternative; justification; impact; expected benefits; anticipated effective dates; and duration requested. The proponent continually seeks innovation and process improvement. Significant process improvements and global exceptions will be considered for addendum to policy prior to the next revision.

Suggested Improvements. Submit changes for improving this publication on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) through channels directly to the office of TCM-TADLP, ATSC, Building 2112 Pershing Avenue, Joint Base Langley-Eustis, VA 23604. Suggested improvements may also be submitted using DA Form 1045 (Army Ideas for Excellence Program Proposal). Individuals and organizations are authorized to send comments electronically.

Distribution. This TRADOC pamphlet is available only on the TRADOC Website http://www.tradoc.army.mil/tpubs.

Summary of Change

TP 350-70-12
The Army Distributed Learning (DL) Guide

This major revision dated 3 May 2013 incorporates the following changes throughout:

o Adds guidance on the planning, analysis, design, development, and delivery of distributed learning products formerly contained in United States Army Training and Doctrine Command pamphlet 350-70-2.

o Updates procedures that support policy in United States Army Training and Doctrine Command regulation 350-70.

o Applies administrative restructuring.

Table of Contents

Table List

Figure List

Chapter 1
Introduction

1-1. Purpose
The purpose of this pamphlet is three-fold:

    a. First, the pamphlet provides guidance on all aspects of the nomination and management of distributed learning (DL) products.

        (1) Nomination of DL products.

        (a) Managing students in Headquarters, Department of the Army quota-managed DL.

        (b) Managing students in self-development DL.

        (2) Planning of DL products.

        (a) Development pre-award phase.

        (b) Development phase

        (c) Government acceptance and certification phase

    b. Second, this pamphlet explains the planning involved in the analysis, design, development, delivery, and evaluation process of DL products.

    c. Third, this pamphlet explains the various roles involved in the management of DL development and in the application of the continuous adaptive learning model utilizing the Army learning policy, which follows the analysis, design, development, implementation and evaluation (ADDIE) process, for developing DL courseware and content.

1-2. References
References, to include forms and publications, are listed in appendix A.

1-3. Explanation of abbreviations and terms
Abbreviations and acronyms used in this pamphlet are listed in the glossary and spelled out the first time they are used.

1-4. Scope
This guidance is not meant to replace other training pamphlets but supplements them with the unique requirements of DL. The guidelines in this pamphlet are applicable to all individuals and organizations managing, or involved in, developing and/or implementing DL content and courseware, to include:

    a. Developers in proponent schools during applicable phases of creating DL products.

    b. Support contractors developing DL products under the Combined Arms Products for Distributed Learning (CAPDL) development support contract.

c. Support contractors developing DL products outside the CAPDL contract.

d. Contractors developing new equipment training courses for system acquisitions, using DL methods and technologies.

e. Developers outside TRADOC schools creating training and education products for home station and deployed training.

Chapter 2
Distributed Learning (DL) Management Overview

2-1. The Army Distributed Learning Program (TADLP)
The Army Distributed Learning Program (TADLP) is a Headquarters, Department of the Army - funded, Chief of Staff, Army -approved program of record, which provides near-term and long-range planning, funding, and requirements to produce content and courseware for delivery to Soldiers, leaders, and civilians anytime, anywhere. In December 2009, the Commander, TRADOC chartered the TRADOC Capability Manager (TCM)-TADLP with the overall responsibility for providing oversight, integration, and management direction in all matters pertaining to TADLP.

2-2. TADLP defined
TADLP delivers standardized training and education to Soldiers, leaders, civilians, and units using multiple delivery means and technologies that provide the capability to enhance and sustain Army readiness. TADLP leverages technology and curriculum design to provide cost-effective and efficient learning content. Twenty-first century training requirements necessitate the following:

a. New policies, procedures, and processes.

b. Persistent access to learning content.

c. Acquiring and maintaining skills of curriculum developers.

d. Assessments of learning.

e. An agile resourcing model.

f. A system that employs continuous feedback of lessons learned.

g. Integration of new technologies and learning sciences.

2-3. DL description
TADLP establishes a technology-enabled learning domain where formal and informal content is easily discoverable, accessible, functional, flexible, and trackable through multiple delivery means including asynchronous, synchronous, and mobile delivery at the point of need.

a. This domain's key characteristics include:

(1) Rapid creation and delivery of rigorous digitized learning content.

(2) Enabled knowledge sharing and collaboration among learners.

(3) Establishment of dynamic social learning networks.

(4) Peer-based learning interactions, facilitators, and instructors for continual lifelong learning opportunities.

(5) Support of professional and personal development goals.

(6) Life cycle management of courseware.

(7) Reach-back for performance support.

b. The domain also facilitates joint, interagency, and intergovernmental training, education, research, and communication.

c. Included in the TCM-TADLP modernization effort are the development, integration, and synchronization of policies and transformation of DL resourcing models. This continuous adaptive learning environment also supports the implementation of new and emerging technologies, learning sciences, dynamic content, and performance support applications.

2-4. TADLP support to Army Force Generation
TADLP supports the full Army Force Generation continuum by ensuring learners have relevant training and education available at the point of need, enabling Soldiers and leaders to spend more time with their families at home station versus long-term temporary duty to schools. This efficient use of training time will provide a critical quality of life balance Soldiers need, given the current and future demands of the operational environment.

2-5. TADLP support to the training domains
TADLP enables the Army's learning continuum and blurs the lines between the training domains. By integrating operational experience into the development of rigorous and relevant content, formal and informal learning, and peer-based learning, Army professionals are encouraged to become lifelong learners. Soldier-created content, institutional instruction, and self-development opportunities are delivered through multiple delivery means, including dynamic social networks, mobile devices, and the Army learning content management capability (ALCMC).

2-6. Operational domain
TADLP supports the first priority of the integrated training environment, the operational domain's brigade-level (and below) collective training at home station. The TADLP supports the operational domain by providing small unit, leader, and individual training and education opportunities through the rapid creation and distribution of experiential based training scenarios and the establishment of dynamic social learning networks. These networks will enable reach-back and on-demand capability to prepare units, Soldiers and leaders to prevail in unified land operations.

2-7. Institutional domain
TADLP supports the institutional domain's four major functions: Initial Military Training, Professional Military Education, Civilian Education System, and functional training. The use of synchronous, asynchronous, and mobile DL delivery strategies and social learning networks will enable the field to exchange doctrine, lessons learned, tactics, techniques and procedures, and other critical information through its reach-back and on-demand content capabilities. By leveraging social learning and expanded synchronous capabilities, centers of excellence support individual and small unit training events at home station more effectively and efficiently than at present. An Army social learning network will connect the Operating Force with the Generating Force to capitalize on recent operational experiences and lessons learned in order to rapidly revise and adapt content for developing new curriculum for Initial Military Training, Professional Military Education, and Civilian Education System.

2-8. Self-development domain
The self-development domain includes planned, competency-based, goal-oriented learning that reinforces and expands the depth and breadth of an individual's knowledge and self/situational awareness, which supports adaptability. It complements operational and institutional learning while enhancing professional competence. This strategy enables self-development activities that allow for individual preparation, sustainment, and leader development, throughout the learner's career to include time in the institutional and operations domains.

2-9. Nomination and prioritization process for DL development

a. Figure 2-1 depicts the TADLP business process that begins with nominations and follows through the continuous process improvements

stage.
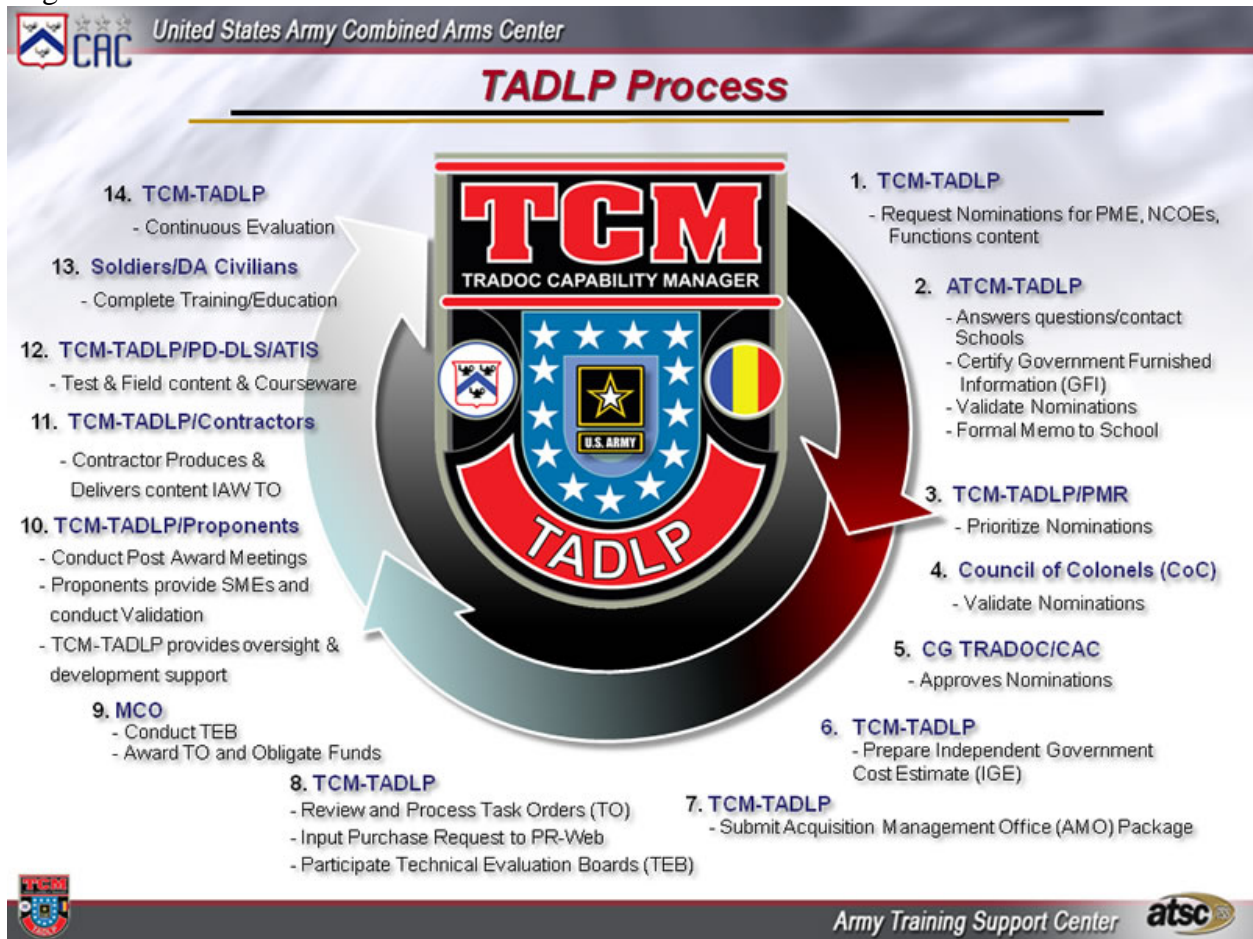
Figure 2-1. The TADLP process

b. The DL nomination/prioritization process is used to identify requirements for training and education products. Courseware and content is nominated for development using the TADLP omnibus contract CAPDL. As part of the nomination process, an integrated product team (IPT) from TADLP will assist centers of excellence and proponents in providing key inputs for development. This team will work with the proponents to help them prepare the requirements for the contract and validate their request to nominate the content. This step is necessary because of the firm fixed price nature of the CAPDL contract.

(1) Successfully contracted DL projects require upfront preparation for the solicitation process so the contractors are aware of what GFI/GFM is available before they submit a bid on a task order (TO).

(2) Requisite GFI and GFM are described below.

(a) Analysis data and results from the CAC-approved automated development system (read only):

- Mission analysis (command-approved collective critical task list).

- Collective critical task analysis report (one for each task).

- Job analysis (command-approved collective critical task list).

- Individual critical task analysis report (one for each task).

(b) Training strategies:

- Long-range individual training strategy (the individual training plan (ITP) for the applicable military occupational specialty (MOS), area of concentration, etc.).

- Short-range individual training strategy for the job being trained (MOS/skill level, area of concentration/skill level).

(c) Training support package that contains current courseware (lessons and lesson plans, etc.):

- Assessments, practical exercise (PE) sheets, and solutions.

- Student handouts and reading materials.

- The approved course administrative data (CAD), program of instruction, and supplemental information required.

- Course management plan.

- Course map.

- Individual student assessment plan (ISAP). Computer software containing instructional materials.

- Graphic training aids, maps, artwork, and video presentations.

- Training aids, devices, and simulations.

- Publications and blank forms or applicable Internet links (for example, field manuals, technical manuals, pamphlets, and regulations).

- Policy letters and memoranda.

- Courseware source files, programming code, raw picture video, or audio files.

- Gaming scenarios, simulations, three-dimensional (3-D) models.

(3) The GFI and GFM will be sent to TCM-TADLP (ATIC-IP). This team reviews and certifies that the technical GFI/GFM is sufficient to enable the contractor to perform the task successfully.

c. After the nomination is validated, the project is prioritized for funding. All DL courseware and content is to support training and education requirements for the total force as outlined below.

(1) The TCM-TADLP biannually requests nominations for development of DL courses and content from proponent agencies. These agencies include proponent centers/schools, National Guard Bureau, U.S. Army Reserve (USAR), Department of the Army (DA), and other

Army Commands/agencies. The tasking order to these agencies includes the nomination criteria to be considered by the nominating agency.

(2) Proponent agencies submit nominations and relative priority with Commandant or delegated authority endorsement.

(3) Unit commanders and special interest groups may also nominate and receive consideration for DL courseware and content prioritization.

Note: Agencies funding their unique DL requirements will receive contracting assistance.

(4) Required mandatory training in accordance with appropriate regulations, mainly concentrated in AR 350-1, annex G, may also be nominated for DL development.

(5) Functional leads for officer, warrant officer, noncommissioned officer, and civilian education systems separately nominate and prioritize their respective DL courseware and content prior to submitting the prioritized list to the TCM-TADLP who, in turn, will consider the requirements when prioritizing at the aggregate level.

(6) Using the Training Support Enterprise process, the TCM-TADLP conducts courseware verification/prioritization during the biannual program management reviews whereby all agencies verify and validate their respective nominations.

(7) The TCM-TADLP will then present the biannual prioritization list to the DL council of colonels for final validation for Commanding General, TRADOC or his delegated representative, the deputy commanding general, CAC, to approve.

(8) The TCM-TADLP uses the approved DL courseware and content list to assist in determining funding and design priorities.

   d. After CAC approval, the nomination priorities are announced, and proponent centers and schools prepare work statements for submission to TCM-TADLP (ATIC-IM).

(1) DL development priorities. The overarching requirement to improve the readiness of the force requires that the DL development effort focuses on individual training/education courses that support the military occupational specialty qualification levels of Active Army and reserve component units. The Army Commands, including the Chief, National Guard Bureau, and the Chief, USAR, report specific training/education needs to the TCM-TADLP. The TCM - TADLP reviews nominations, establishes priorities, and incorporates them into the DL prioritization list. The prioritization list also includes the following command guidance:

(a) Courses that support leader development.

(b) Courses that support mission command.

(c) Courses that support unified land operations.

(2) Requests to cancel or remove courses. When a proponent school requests cancellation or removal of a course from the DL prioritization list, the school commandant, or designated representative, signs and forwards the request to the TCM-TADLP with supporting rationale that justifies removal. The TCM-TADLP adjusts the DL prioritization list, where appropriate.

e. TCM-TADLP prepares an acquisition package in coordination with ATSC Resource Management Division for CAC approval.

(1) The TCM-TADLP coordinates with the proponents to determine how to develop courses on the DL master prioritization list.

(2) For DL products, proponents will identify the types of delivery media to be developed, and the approximate number of delivery hours, per media type.

(3) The TCM-TADLP determines the annual development resource requirement by calculating the estimated cost to develop DL courseware for each course on the list, based on the percentage of hours allocated to each medium and the hourly cost per medium.

(4) The TCM-TADLP prepares an independent government cost estimate as part of the acquisition package for each course contracted for development.

f. Additional guidance for proponents/schools, to avoid delays in processing nominations:

(1) Do not nominate place-holders to be replaced by other courses later. Thirty percent of the workload must be recalculated, which leads to a delay in processing. It also affects estimated costs of courseware conversion.

(2) Conduct an in-depth analysis before course nomination.

(3) If GFI is not available, determine whether contract development of the GFI is needed.

Chapter 3
Planning of DL Products

3-1. The Army Learning Model (ALM)

a. TP 525-8-2 states that the ALM must develop adaptable Soldiers and leaders, adaptive delivery systems, and sustained adaptation. It must provide a learning environment with instructional strategies, expert facilitators, and technologies that support the student. In recent years, the rapid development of computer and communication technologies has established new instructional opportunities in DL. A modernized TADLP will ensure a tactical edge by deploying innovative and emerging technologies that have the potential to revolutionize technological advances and drive transformation. These opportunities will provide better self-discovery, peer-to-peer interaction, and experience-based learning in support of the ALM. A modernized TADLP and associated technologies will permit active learning using automated and adaptive information extraction, assimilation, and management to provide Soldiers with the

ability to become adaptive, critical thinkers able to solve complex problems in uncertain operational environments.

b. Some of the key characteristics of the ALM environment for DL include the following: ALCMC–supported, context-based, collaborative, problem-centered instruction with assessments; evaluations, tracking, and feedback; blended learning, adaptive learning, and technology-delivered instruction; a repository of DL modules; simulated environments integrated into DL products or used for blended learning; and performance support applications (mobile Internet delivery).

3-2. DL empowered by the ALM

a. In recent years, the rapid development of computer and communication technologies has established new instructional opportunities in DL.

b. DL content must be developed for delivery on a variety of platforms and may contain stand-alone and reusable modules, video, game-based scenarios, digital tutors, and assessments that are tailored for students.

c. DL content might also incorporate the use of social media, massively multiplayer online games, and other emerging technologies. DL leverages the power of information and communication technologies (such as simulation, IMI, video teletraining (VTT), and e-learning) and can be either real time (synchronous) or non-real time (asynchronous).

d. DL will also continue to support Soldiers and Army civilians serving downrange or in remote areas with little or no bandwidth by offering training and education products via digital video disk (DVD) and compact disk-read only memory (CD-ROM).

3-3. Interactive Multimedia Instruction (IMI)
IMI is a term applied to a group of predominantly interactive, electronically delivered DL and support products. IMI products include instructional software and software management tools used in support of instructional programs (See figure 3-1). The following are several types of IMI.
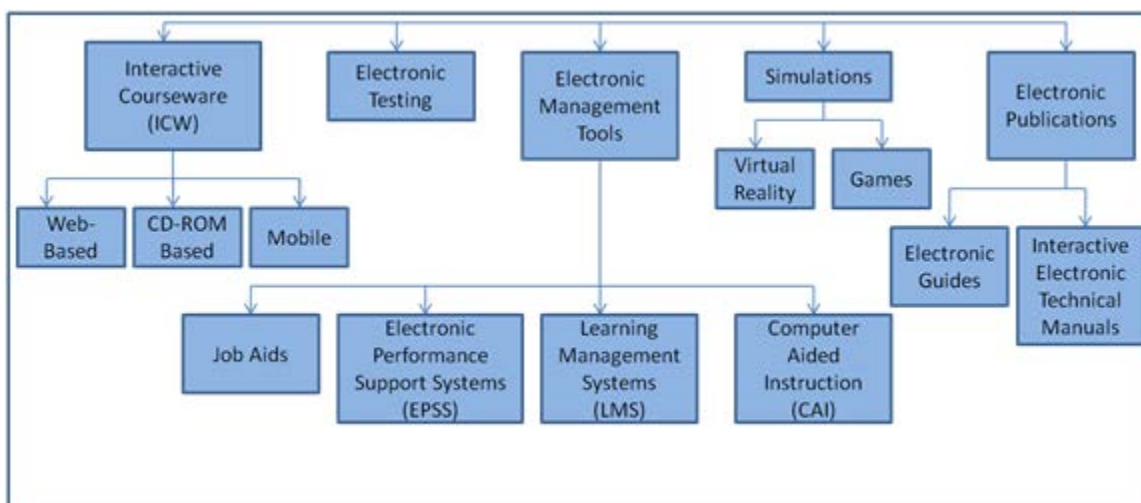
Figure 3-1. Interactive multimedia instruction (IMI) examples

a. E-learning (asynchronous) is instructional software integrating a combination of text, graphics, animation, sound, and video delivered via the Internet. The presentation may require active user interaction with the software in the form of questions, simulations, virtual reality, or games; however, it may only require passive interaction to navigate through lessons. Feedback can be presented to the student in response to computer interaction. The student has control of location and pace of instruction. E-learning (asynchronous) includes Web-based training (WBT) and on-line games and simulations.

b. Instructor-facilitated (asynchronous) instruction is loosely defined as computer-based technology that integrates a combination of text, graphics, animation, sound, and video delivered via the Web and facilitated by a live instructor. It may include collaboration through discussion boards, e-mail, animation, simulations, and games, with a combination of different methods possibly being used. The instructor/facilitator controls instruction, makes assignments, requires postings, provides discussion questions, and gives feedback to the students but is not present at the same time as the students.

c. A Webinar (seminar or instruction conducted over the Internet) is a type of Web-based conferencing. It is "live" in the sense that information is conveyed according to an agenda with a starting and ending time. In most cases, the instructor/facilitator may speak over a standard telephone line, pointing out information being presented onscreen, and the students can respond over their own telephones. Collaborative software also adds many additional features that can be used such as chat, whiteboards, questions/polling, and application sharing.

d. VTT is a means of broadcasting to multiple sites through traditional television broadcast medium using live video and audio. VTT includes student participation in the form of two-way communication between personnel conducting the program and students located at remote sites. The instruction is usually in a discussion or demonstration format.

e. Computer-based training (CBT) is delivered via computer. The student interacts with the computer usually with the mouse or keyboard. The computer provides the majority of the stimulus to which the student responds. The computer analyzes the response and provides

feedback to the student. The content is stored on the computer and the student must use that computer. The content may be coming from the Web, CD-ROM, portable storage media, or downloaded on the computer itself.

f. Web-Based Training (WBT) is individualized instruction delivered over computer networks and displayed by a Web browser. WBT is not downloaded CBT, but rather on-demand instruction stored in a server and accessed across a network. WBT can be updated very rapidly, and access to the instruction is controlled by the provider.

g. Electronic performance support system (EPSS) refers to applications designed to run simultaneously with other applications or embedded within other applications that provide support for the user in accomplishing specific tasks. An EPSS may provide needed information, present job aids, and deliver just-in-time, context-sensitive instruction on demand. A Web-based performance support system is an EPSS that uses Web technology to deliver support in an enterprise environment.

h. Simulation, also known as embedded system training, is designed to give students the experience of participating in a simulation of a complex dynamic system. Participants operate from their own site in an open client-server architecture, which enables many users at the various sites to control the behavior of individual objects or agents and to view the aggregated results.

i. A learning management system (LMS) is a software environment that hosts interactive learning sessions with students and instructors/facilitators. It is a delivery platform for WBT to include the use of IMI. An LMS provides a method for registration, delivery, and tracking of DL courses. It may also allow access to other content to enhance learning, such as research materials and additional training aids. An LMS offers collaboration tools that permit one-to-one or one-to-many communication such as threaded discussion, e-mail, and live chat.

3-4. DL and ADDIE process
Instructional design is a systematic process that begins with planning and consists of the five phases of the ADDIE process: analysis, design, development, implementation and evaluation. Resourcing, developing, and delivering all Army learning products, courses, and events occurs within the general, non-linear, ADDIE phases. Each phase has outputs that feed into the next phase of the process with the exception of evaluation, which should occur during every phase. Continuous evaluation can eliminate or reduce wasted effort. Phases do not have to be entered sequentially and developers may move into and out of each phase.

3-5. Planning for DL
DL is instruction presented with a variety of tools and techniques to engage and motivate the learner. Effective DL instruction considers learning preferences, provides for immediate (or delayed) access to an instructor/facilitator, and offers diagnostic assessments that adapt the instruction to the student. These effective and efficient DL designs require careful analysis and planning for instructional content, tools, and techniques of delivery. To assist in the development and support of effective DL products, this pamphlet provides detailed procedures, examples, samples, checklists, and other useful links. Planning for DL begins with careful consideration of all the steps in the design and development process for both in-house and contracted work. By preparing a list of each of these steps in each phase, a fateful misstep may

be prevented. The steps, found in the template located at
http://www.atsc.army.mil/tadlp/content/index.asp can help you to outline the steps you need for
in-house work or to track the steps of your contractor.

3-6. Planning for IMI
Effective IMI provides opportunities for student interaction, enhances information retention, and
clarifies complex information by implementing feedback and remediation (see appendix F,
Multimedia Elements Guidelines). Follow these guidelines when planning an IMI project:

   a. Design for interaction.

      (1) Be consistent. People are not comfortable with change. Consistency does not go
unnoticed.

      (a) Use design constants so students have a reasonable expectation for placement and
functionality. Otherwise, they are more concerned with where things are and may miss the value
of the instruction.

      (b) Similar behaviors should have similar appearance. Students should not have to guess
at the functionality of these items, such as hide and show functionality.

      (c) Components that have a different behavior, such as tabs, drawers, arrows, and zoom,
should have a different appearance.

      (d) Maintain consistency in appearance and behavior with the following:

   • Color, pattern, and texture

   • Size, proportion, and rotation

   • Shape

   • Alignment (use grids and guides)

   • Typography

   • Visibility

   • Transitions and motion graphics

   • Rollovers/mouse-overs

   • Tooltips

   • Layers and pop-ups

      (2) Ensure visibility. Interaction must be visible in order to invite and engage the student.
Hidden interactions decrease usability and efficiency.

      (a) Discoverability involving luck or chance may lead to student failure.

      (b) Visual cues, such as buttons, arrows, picture icons, textures (sliders, toggle), text style,
and color should hint at functionality.

(3) Reduce the learning curve. Use meaningful and unambiguous labels, content, and interactions to make it possible to quickly understand and repeat an experience. Students should not have to learn a new screen dynamic with every course.

(4) Ensure predictability. Set expectations about what will happen during and after an interaction to minimize confusion and dissatisfaction.

(5) Incorporate feedback.

(a) Acknowledge interactions (clicks, fades, sound, etc.) and provide information about status, location, progress, and completion.

(b) Provide feedback in the context of the learned material. Sometimes it is provided immediately upon selection of an answer, or it may be delayed feedback after all answers are submitted.

(6) Incorporate collaborative learning opportunities and mentoring with an instructor/facilitator, when possible.

b. Present information in sequential steps. If there is no required sequence, order the steps from simple to complex. Present prerequisite skills and knowledge necessary for student success.

(1) Plan content sequence.

(a) Sequence content based on the instructional goal. For example, you cannot learn algebra until you learn basic math. Therefore, there is an instructional need to sequence students first through basic math.

(b) Do not force sequence unless there is an instructional requirement. There is an assumption with DL that students are self-directed and self-motivated and are comfortable with learning without an instructor/facilitator or other students.

- Do not force students to listen to all the audio or watch all the video before advancing.

- Do not require all the links to be clicked or all the rollover text to be revealed before allowing students to advance.

(2) Allow students to control the pace. Permit students to proceed (learn) at their own pace within certain limits (time allowed, mandatory completion date, retries permitted).

(a) Schedule follow-on instruction at a precise date and location for students to meet Army-directed training/education requirements.

(b) Base management controls on the time it takes to complete the instruction and the number of times students are permitted to retake a lesson or assessment to prove mastery of the learning objective.

(3) Take advantage of media and present the instructional material to benefit students. Just remember not to overdo media usage. There should be an instructional purpose for each media element.

(4) Allow repeating of exercises/simulations many times, using and developing different solutions to problems; such as "what if" drills with time limitations.

(5) Expose students to unpredictable situations (complexity, frequency, and timing), to maximize learning and improve job performance (enhance transfer and improve ability to solve problems).

3-7. Planning multimedia elements

a. Develop a list of the multimedia elements that will be incorporated in the courseware. Multimedia elements such as graphics, video, audio, animations, and photos are developed upon the completion of the storyboards. For contract-based development, these are furnished to the contractor as part of the GFI.

b. The following are visual guidelines or recommendations for content layout, appearance, text development, and storyboards.

(1) When developing the content layout, ensure that it is visually pleasing and provides for smooth flow from screen to screen. Place key information in prominent areas (for example, away from the border) and present recurring information (for example, titles) in constant locations.

(2) Content layout should be clear and have continuity. This means it should be consistent regarding standardization of controls, screen placement, writing techniques (style, titles, text fonts, etc.), audio, special effects, color, and cues. Provide consistent layout for the same types of screens (for example, checks-on-learning) within a given course. Develop and use content layout templates when possible to maintain consistency and to speed the development process.

Note: Material gathered from Defense Automated Visual Information System (DAVIS), Defense Instructional Technology Information System (DITIS), and/or Advanced Distributed Learning (ADL) repositories are not expected to be consistent with the new material being developed. See appendix J, ADL Registry/Army Content Repository for more details.

(3) The following are guidelines for content appearance.

(a) Present information in a top-down, left-to-right format.

(b) Ensure that key details are easily identified.

(c) Standardize locations on the screen to display specific instructions/prompts for students.

(d) Incorporate text that describes or labels visual elements within the graphic itself whenever possible.

(e) Integrate diversity (gender, ethnic groups, etc.) appropriate to the target audience when developing content including graphics, animations, and text.

(f) Use color consistently. Each color should have a clear and consistent meaning.

(g) Ensure adequate contrast between text and background colors.

(h) Avoid hues of colors that bleed into the background.

(i) Use underlines or an image to indicate links. Color alone may not be seen by students who have difficulty perceiving color.

(j) Design rollovers with a change in image or text. Changes in color alone may not be seen by students who have difficulty perceiving color.

(k) Use bright colors. Some students can see all colors but have a difficult time distinguishing them if they suffer from color weakness.

(4) Well-structured text enhances readability, increases understanding, and aids recall of information. The following are guidelines for text development.

(a) Include a visual element (such as a graphic, animation, or video) that directly relates to the text whenever possible.

(b) Incorporate any needed on-screen text within the visual element rather than use captions, whenever possible.

(c) Limit the amount of text on the screen.

(d) Put cautions, warnings, environmental protection factors, or exceptions to some prescribed action before the instructions.

(e) Organize text into small but logical chunks of relevant information.

(f) Keep text simple and direct.

(g) Use a conversational and personalized style rather than a formal style.

(h) Use short sentences and paragraphs. Break up lengthy sentences using bullets, numbered lists, tables, and/or charts.

(i) Provide generous white space to separate blocks of text.

(j) Start paragraphs with the main idea, followed by topically related subordinate text.

(k) Provide students with the necessary information in the fewest possible steps in the shortest time possible.

(l) Address only one concept, procedure, or item of instruction on a screen, unless it is instructionally necessary or common sense to do otherwise (for example, to compare and contrast, or to present a short series of familiar steps).

(m) Make clear the transition from one concept to another.

(n) Maintain parallel construction, noun-pronoun, and noun-verb agreement.

(o) Use active voice whenever possible.

(p) Use bold for emphasis. Avoid underlining except for hyperlinks.

(q) Align text flush left, ragged right. Avoid indenting paragraphs.

(r) Use uppercase words sparingly (for example, titles); avoid using words in all uppercase.

(s) Hyperlink glossary words, when appropriate.

(t) Avoid scrolling by using more pages when presenting large amounts of text.

(u) Avoid using paragraphs of on-screen text, narration, and visual elements (such as graphic, animation, or video) simultaneously.

3-8. Planning visual elements
Audio and visuals should only be used when they will help to enrich the learning experience.

   a. Visuals present information with some type of graphic. Only use visuals that relate directly to achieving the learning objective and content. The following are guidelines for visual elements:

(1) Balance selection of graphics with the bandwidth required and the characteristics necessary to support the learning objective (for example, still picture, animation, or narration).

(2) Ensure graphics, photographs, and animations have a consistent appearance by establishing standards (for backgrounds, size, color, borders, etc.).

(3) Incorporate any needed on-screen text within the visual element rather than using captions, when possible.

(4) Use visual representations of text (such as graphic organizers, concept maps, hierarchies, matrices, flowcharts), whenever possible.

(5) Reuse graphics to reinforce basic concepts.

(6) Provide recurring information in consistent locations (such as buttons or navigations).

(7) Maintain a constant perspective in a series of visuals. Cue students if a change of perspective is necessary.

(8) Title charts clearly with appropriately sized fonts.

(9) Avoid overloading charts with small symbols or graphics.

(10) Avoid cluttering the screen with too many visual elements.

(11) Do not include brand name, contractor, or other corporate logos.

b. Graphics include clip art, drawings, charts, and tables. The following are guidelines for static graphics/photographs:

(1) Ensure adequate contrast between subject and background colors.

(2) Ensure that key details are easily identifiable. Avoid using too many visual cues or too many colors at once.

c. The following are guidelines for animation:

(1) Design animations appropriate to the target audience.

(2) Combine animation with narration rather than with chunks of on-screen text, where possible.

(3) Incorporate student interaction into animations, where instructionally sound.

(4) Allow students to play, pause, and repeat animation.

(5) Use animation to show key concepts that are difficult, impossible, or cost-prohibitive to describe otherwise, especially when the animation (or parts of it) can be reused elsewhere in the course or on a splash screen.

(6) Match the duration of animation with narration to avoid long pauses.

(7) Reserve blinking for critical situations requiring immediate attention or action.

(8) Avoid animation that wanders across the screen or otherwise distracts students from the content.

d. The following are guidelines for video:

(1) Use video only when it is essential to teach a specific learning objective, because video consumes memory and bandwidth.

(2) Use video to reinforce, clarify, or emphasize a specific learning objective that cannot be taught effectively using graphics, stills, photographs, or animations.

(3) Use the appropriate method of instruction (such as demonstration, panel discussion, or guest speaker) for the content presented.

(4) Light the main subject well and eliminate background distractions.

(5) Use video or graphic window overlays to show extreme close-ups of small objects, such as wide-angle views for knobs and switches.

(6) Allow students to play, pause, and repeat video.

(7) Play video automatically as soon as the page is loaded unless there is an instructional need for students to initiate it (then, provide a "play" button).

(8) Allow students to proceed without viewing the video.

(9) Use a separate page for video scripts and reference the corresponding screen number. Use a two-column format. In the left column, describe the scene to be developed. In the right column, state the actual words to record.

(10) Plan video segments in advance of the editing process to avoid excessive costs.

(11) Film several takes of the same scene or subject with adequate footage before and after to facilitate editing.

(12) For Web-based delivery, avoid traditional techniques (such as zooming, panning, transitional wipes and dissolves, or fast motion subjects) that increase the duration and file size unless they are instructionally necessary.

Note: Audio with a photograph is often just as effective as a video of a talking head. Use the talking head format only when an expert is used to motivate students.

e. The following are guidelines for interactive graphics:

(1) Allow students two opportunities to complete the interactivity whenever possible.

(2) Provide descriptive feedback on the same screen, if applicable.

f. The following are guidelines for three-dimensional graphics:

(1) Use to show key concepts that are difficult to describe, or are impossible or cost-prohibitive to photograph or film.

(2) Consider using when the graphic or parts of the graphic can be reused elsewhere in the course to save on overall development time.

(3) Consider "hybrid" animations that use three-dimensional imagery and two-dimensional animations to reduce file size.

g. The following are guidelines for three-dimensional visualizations:

(1) Ensure equipment parts are recognizable.

(2) Allow students to drill down to greater detail.

(3) Limit the number of individual parts, preferably less than 50.

(4) Consider using colors instead of textures on some, or even all, parts unless instructionally necessary.

(5) Reduce or eliminate backgrounds unless there is an instructional need to display them.

h. The following are guidelines for real-time simulations:

(1) Use when students must act on realistic scenarios without attendant dangers and inefficiency (time and money).

(2) Use for exploration and reflection.

(3) Incorporate demonstrations, coaching, and explanations whenever possible.

(4) Consider making levels of increased difficulty, such as beginner and advanced levels.

3-9. Planning audio elements
The following are guidelines for planning audio elements:

a. State in the storyboard the actual words or sounds to record. If additional space is necessary, add a page.

b. Provide complete closed captioning.

c. Spell out all numbers for the script/narration.

Note: This is not meant for on-screen text.

d. Do not have the narrator read on-screen text word for word.

e. Indicate how to pronounce acronyms and unfamiliar words for the script/narration (for example, A-T-S-C).

Note: This not meant for on-screen text.

f. Use a conversational style rather than a formal style.

g. Use short sentences and define acronyms, if used.

h. Provide students with the necessary information in the fewest possible steps, in the shortest time possible.

i. Make clear the transition from one concept to another; use transitional words such as "first," "second," "next," or "as a result."

j. Use active voice whenever possible.

k. Allow students to play, pause, and repeat audio.

l. Allow students to proceed without playing audio.

m. Write narration and dialogue to include a preview summary that outlines the main steps.

n. Organize narration and dialogue into short, logical chunks that are simple and direct.

o. Set narration to play automatically (as soon as the page is loaded) for individual page narration.

p. Write narration that supports on-screen text and graphics, rather than competes with them.

q. Use combinations of narration and visual elements rather than combinations of paragraphs of on-screen text and visual elements.

r. Match the duration of narration with animation to avoid long pauses.

s. Use sound effects to add realism, when appropriate.

t. Avoid sound effects that indicate correct or incorrect responses, as they can quickly become irritating.

3-10. Planning text elements
Text is used to present information and communicate ideas, procedures, and concepts. Text that is cluttered and hard to read does not help to accomplish any of these goals. The following are guidelines for planning text elements.

a. Place text as it will be read (left to right and top to bottom).

b. Minimize text on a single screen.

c. Be concise.

d. Do not scroll the text, if information is critical.

e. Select text size and font that are easy to see and read.

(1) Use fonts that are sans serif (without flourish) for on-screen and Web-based viewing. Use of text types or fonts with a flourish (serif) can result in poor readability.

(2) Determine text size based on the students' ability to easily see and read the information. Size is determined by font selection. General guidelines are headings (48 points), titles (36 points), and body (24 points), but these may change based on font selection.

(3) Remain consistent in font size and type throughout the material.

f. The following are guidelines for selecting text color.

(1) Avoid using high-chroma, brilliant, or electric colors for text fields since they make reading difficult.

(2) Ensure text and graphic colors contrast with background color.

(3) Use color text combinations that aid reading or viewing.

(4) Use white or light yellow text for dark backgrounds.

(5) Use blue, black, or dark text for light backgrounds, such as beige.

(6) Use color background combinations to identify the type of screen (such as procedure, checks-on-learning, caution, warning, or menu).

(7) Specify color combinations in the IMI design strategy conventions.

g. There are many ways to enter text into IMI. The entry method depends on authoring tools used in the design. The following are guidelines for entering text.

(1) Typing with a keyboard directly into an authoring tool is the normal method. This must be done keeping students in mind. View the text in the same manner the students will see it to ensure the text is of appropriate size, color, and contrast.

(2) Scanning or importing text as a graphic image. While this method is possible, caution must be exercised. A scanned image may lose resolution when stretched to fit a design.

(3) Using a graphic representation of text can result in poor, unreadable text. Use caution with this technique.

3-11. Planning for development time
In planning IMI, it is useful to consider the amount of time required to develop the project. This provides a basis for evaluating a cost-to-benefit decision.

a. Estimate development hours. Certain factors and variables can affect the development time required to develop one hour of completed IMI. The following list of factors defines a best-case situation:

(1) The developer is familiar with the subject matter and has access to in-house subject matter experts (SMEs).

(2) The subject matter is not highly complex.

(3) The instructional content is stable. In other words, the system for which the IMI is being developed exists and is not emerging, and the tasks selected for IMI DL do not continually change.

(4) The instructional content is well documented. A needs analysis and task analysis are complete, giving the developer a good idea of the performance expected and tasks to teach. The technical materials supporting the IMI development are accurate and available.

(5) The developer is familiar with the selected IMI authoring software.

(6) The developer is familiar with the target audience.

(7) The development team consists of individuals experienced with IMI management, design, and development.

(8) The selected IMI authoring system is mature and stable. No beta versions are used.

(9) A lesson format, to include the design strategy, is agreed upon in advance and management has approved the strategy, prototype lesson, and lesson specifications.

(10) The development process is standardized.

(11) An instructional strategy is approved and a wireframe is tested.

(12) The Contracting Officer Representative (COR) and SME work closely with the development team on a regular basis. The COR uses objective acceptance criteria and does not continually change the individual responsible for reviewing and approving the lessons.

(13) Best commercial practices are accepted for software development and video production. There is no requirement to document to an Army standard.

(14) All required resources are in place.

   b. Determine development time. This section provides a baseline estimate to begin the process of determining the total number of hours required to design, develop, and evaluate one hour of IMI. Table 3-1 lists estimated hours of development for one hour of IMI. Centers and schools may use these optional time values (for planning purposes only) to help plan, or contract for, IMI development. Do not use the estimated times for staffing purposes. For a full discussion of levels of interactivity, see appendix D, Student Control, Navigation, and Interaction.

Table 3-1
Estimated hours to develop one hour of IMI

Level of interactivity	Estimated time
1. Passive	50-150
2. Simple	150-300
3. Complex	300-600
4. Real-time	400-700

c. Identify factors affecting development. Many factors might affect the IMI development effort with some that might impact the cost and timeliness of the product. See table 3-2 for factors affecting development.

Table 3-2
Factors affecting development

Factors	Increase number of hours by:	Risk scale (none = 1, high = 5)
1. No "in-house" SMEs; must rely solely on use of proponent SMEs.	25	2
2. Subject matter is highly complex.	100	4
3. Instructional content is unstable. System for which IMI is being developed is emerging. Tasks for IMI constantly changing.	100	5
4. Inadequate documentation. No needs assessment performed. No task analysis or learning analysis data. Technical manuals nonexistent or not helpful.	20	4
5. Total IMI course length less than 100 hours (less potential for use of templates, shell, etc.).	20	1
6. Developer not familiar with IMI software package/authoring tool.	15	2
7. Developer not familiar with target audience.	10	2
8. Best commercial practices not acceptable for video, graphics, and software development. Must develop to a specification and deliver large amount of documentation.	50	2

9. Inexperienced development team:
  a. Developer inexperienced.
  b. Manager inexperienced.
  c. Programmer inexperienced.
	a. 80
	b. 100
	c. 60
		3-4

10. Using a beta version of the authoring tool.	80	4
11. Design plan is not approved. No standardized development process to follow.	50	5
12. Management not using objective and consistent acceptance criteria. Management unsure of what is needed, and does not communicate with developer.	50	5
13. Required resources not in place at start of project.	20	1

d. Estimate impact of changes. Examples of changes often encountered during IMI development are in table 3-3. The table shows the degree of effort commonly associated with minor, moderate, and major changes. Degrees of effort are used to help the manager determine if the change will require additional funds to implement. Table 3-3 is based on a single instance. Multiple instances of the same occurrence will impact the degree of effort involved.

Table 3-3
Degree of effort associated with changes

Type of change	Examples and associated degree of effort		
	Minor	**Moderate**	**Major**
1. Technical	Switch position is wrong.	Change functioning of an entire component due to an equipment modification.	Introduce entire set of new tasks.
2. Instructional	Allow student two tries, instead of one.	Change one multiple choice assessment to another format.	Introduce entire new strategy on how to assess.
3. Media	Change font.	Add four full-motion video shots.	Replace all graphics with video.

e. Figure 3-2 is an example constructed using the tables 3-1 and 3-2.

Level of Interactivity	Estimated Time
1 – Passive	50-150
2 – Simple	150-300
3 – Complex	300-600
4 – Real-time	400-700

Factors affecting change	Increase Number of Hours By:	RISK (Scale 1-5) None-High 1 2 3 4 5
No "in-house" SMEs; must rely solely on use of proponent SMEs.	25	2
Subject matter is highly complex.	100	4
Instructional content is unstable. System for which IMI is being developed is emerging. Tasks for IMI constantly changing.	100	5
Inadequate documentation. No training needs assessment performed. No task analysis or learning analysis data. Technical manuals nonexistent, or not helpful.	20	4
Total IMI course length <100 hours. (Less potential for use of templates, shell, etc.)	20	1
Developer not familiar with IMI software/authoring package.	15	2
Developer not familiar with target audience.	10	2
Best commercial practices not acceptable for video, graphics production, and software development. Must develop to a specification and deliver large amount of documentation.	50	2
Inexperienced project team: • IMI designers inexperienced. • IMI manager inexperienced. • IMI programmer inexperienced.	80 100 60	3 4
Using a beta version of the authoring package.	80	4
Design strategy is not approved. No standardized development process to follow.	50	5
Management not using objective and consistent acceptance criteria. Management unsure of what is needed, and does not communicate with developer.	50	5
Required resources not in place at start of project.	20	1

Step 1. Assume that Level 2 ICW was estimated to train a skill.

Step 2. The product for development is IMI, and the course length is estimated at 150 hours.

Step 3. The software is familiar, and the course includes experienced people.

Step 4. Programming and video production is completed in-house. There are no specification requirements; however, no training needs assessment has been performed, and the subject matter is highly complex (add 100 hours).

Step 5. There are no in-house SMEs (add 25 hours).

Step 6. The instructional content is stable, but the documentation is poor (add 20 hours).

Step 7. The target audience is not familiar (add 10 hours).

The total number of hours. Beginning with the number 150 (the number of hours it would take to develop one hour given the best case situation), add a total of 155 hours to the estimate, bringing the total up to 305 hours to develop one hour of instruction.

150
100
25
20
10
305 hours of production per hour of level two development

Figure 3-2. Factors' impact on development example

f. Price IMI development. After determining development time, the price for that development can be estimated using the presentation categories as defined in table 3-4. The presentation categories are initially derived from the level of interactivity related to the learning objective, but this is only one element of cost. Contractors base contract pricing on the complexity of the courseware, the levels of interactivity, and the development costs associated with audio and video.

Table 3-4
Presentation categories

Category	Description
Category 1: low-grade presentation	a. This is the lowest (baseline) category of IMI development. It is normally a knowledge or familiarization lesson, provided in a linear format (one idea after another). d. Category 1 is used primarily for introducing an idea or concept. Students have little or no control over the sequence and timed events of the lesson material. e. Minimal interactivity is provided by selective screen icons and inserted into the lesson through typical input/output peripherals and programming protocols. f. This category may include simple developed graphics and/or clip art, customer provided video and audio clips. Instruction will be delivered by stand-alone personal computer.
Category 2: medium-grade presentation	a. This category involves the recall of more information than a category 1 presentation and allows students more control over the lesson's scenario through screen icons and other peripherals, such as light pen, touch screen, track ball, or mouse. b. Typically, category 2 is used for non-complex operations and maintenance lessons. c. Simple emulations or simulations are presented to students. For example, students are requested to rotate switches, turn dials, make adjustments, or identify and replace a faulted component as part of a procedure. d. This category also may include simple to complex developed graphics, clip art, and audio with customer-provided video clips and animation.

Table 3-4
Presentation categories

Category	Description
Category 3: high-grade simulation presentation	a. This category involves the recall of more complex information (compared to categories 1 and 2) and allows students an increased level of control over the lesson scenario through peripherals such as light pen, touch screen, track ball, or mouse. g. Video, graphics, or combinations of both are presented simulating the operation of a system, subsystem, or equipment. h. The lesson scenario instructional material typically is complex and involves more frequent use of peripherals to transfer learning. i. Operation and maintenance procedures are normally practiced with category 3 scenarios and students may be required to alternate between multiple screens to keep pace with the lesson content. j. Multiple software branches (two to three levels) and rapid response are provided to support remediation. k. Emulations and simulations are an integral part of this presentation. l. This category may also include complex developed graphics, and/or clip art, and the development of video, audio, and animation clips.
Category 4: Real-time simulation presentation	a. This IMI category involves more in-depth recall of a larger amount of information (compared to categories 1, 2, and 3) and allows students an increased level of control over the lesson. b. Every possible subtask is analyzed and presented with full, on-screen interaction, similar to the approach used in aircraft simulator technology. c. The lesson content is extremely complex and involves more frequent use of peripherals to transfer learning. d. This category normally supports certification, recertification, or qualification requirements. e. Complicated operation and maintenance procedures are normally practiced with category 4 and involves all of the elements of categories 1, 2, and 3 presentations plus the following: (1) High degree of interactivity. (2) Extensive branching (four or more levels). (3) Levels of sophistication — short of artificial intelligence.

(1) Typically, presentation category 1 uses level 1 interactivity, with simple visuals and basic instructional delivery mode. However, a level 1 interactivity may require complex visuals (that is, high-fidelity computer-generated graphics, space, and photography) or complex instructional delivery mode (such as a flight simulator) raising the cost of development.

(2) The presentation category is selected based on the level of interactivity, the complexity of the visual requirements, and the complexity of the instructional delivery mode.

(3) Once the presentation category has been determined, it can be recorded on the checklist. Next, the level of interactivity is determined based on the learning level and the type of interaction planned for students with the content. This is also recorded in the checklist (see the example in figure 3-3, below).

Interactivity Presentation Category Selection

Learning Objective Number	FACTORS				Score	Category of IMI Presentation
	(a) Learning Level	(b) Level of Interactivity (Note. Just enter the level)	(c) Sensory Stimuli Rqt/Cost Factor	(d) Instructional Delivery Mode/Cost Factor		
LO1	1	2	1	2.5	6.5	Category 2
LO2	2	3	3	2.5	10.5	Category 3

If your Interactivity Presentation Score is:		The category is:
	Score of 4 or less	Category 1
	Score of 5 through 8	Category 2
	Score of 9 through 12	Category 3
	Score of 13 through 16	Category 4

Figure 3-3. Presentation category selection example

(a) Learning level and scores. Learning content is:

- Fact learning, rule learning, and perception (equals 1).

- Procedure learning, readiness, guided response, receiving, and responding (equals 2.5).

- Discrimination learning, problem-solving, mechanism, origination, continuous movement, adaptation, valuing, and competence (equals 4).

(b) Levels of interactivity. Rate the level of interaction students will be engaged in with the levels of interactivity (see appendix D for full definition of levels). Level of interactivity is:

- Passive (equals 1) when students are solely receivers of information.

- Limited interactivity (equals 2) when students make simple response to instructional cues.

- Complex participation (equals 3) when students make a variety of responses using varied techniques in answer to instructional cues.

- Real-time participation (equals 4) when students are directly involved in a life-like set of complex cues and responses.

(c) Sensory stimulus requirement/cost factor. Identify the sensory stimulus requirement necessary to support the learning objectives. Assign a cost factor (low, medium, high) to each sensory stimulus requirement. The cost factors are:

- Low (equals 1) when using commercially available or GFM (graphics, animation, audio recordings, digital video recordings, photography, etc.). Costs are limited to physical integration into courseware.

- Medium (equals 2.5) when development of original materials or adaptation of existing materials is required. Limited amount of resources are required to develop them. For example, two-dimensional graphics will probably be in the medium cost category

- High (equals 4) when development of original materials is required. More complex efforts and resources are required to develop than for medium. For example, high fidelity computer-generated graphics, complex animation, three-dimensional graphics, and complex video production

(d) The presentation category is selected based on the level of interactivity, the complexity of the visual requirements, and the complexity of the instructional delivery mode.

(e) The example in figure 3-4 is a category 1 low-grade presentation because it involves passive viewing with simple graphics.
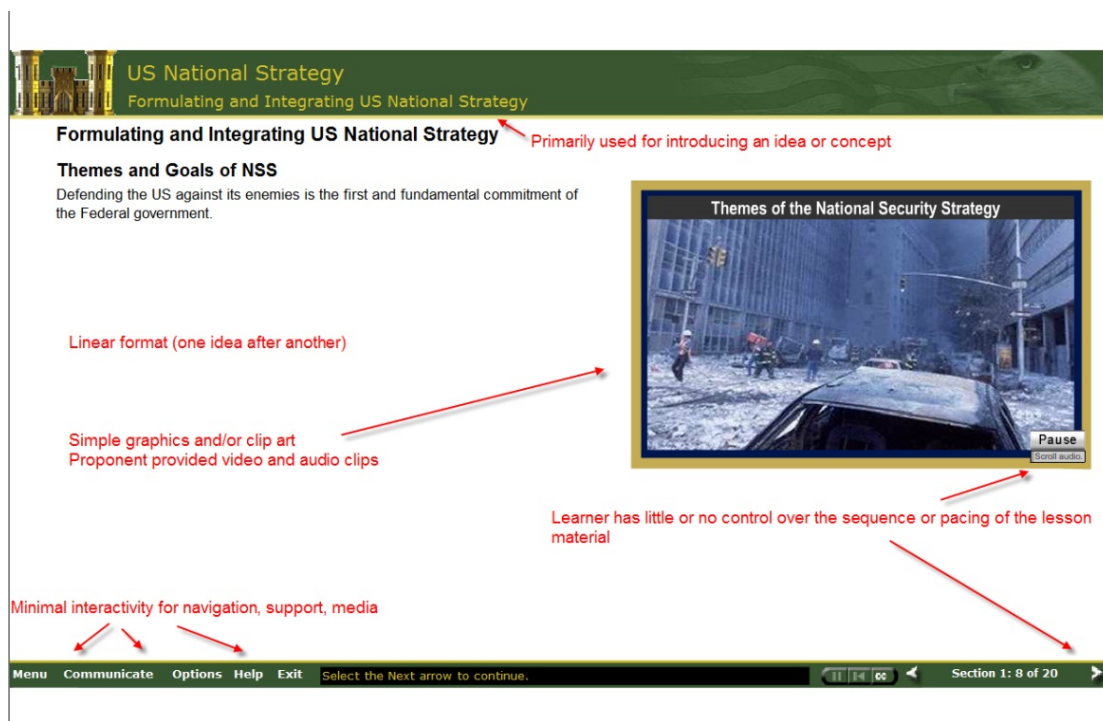
Figure 3-4. Category 1 low-grade presentation

(f) The example in figure 3-5 is a category 1 high-grade simulation presentation. The difference between figures 3-4 and 3-5 is in the fidelity of the graphical presentation that was developed specifically for the product.
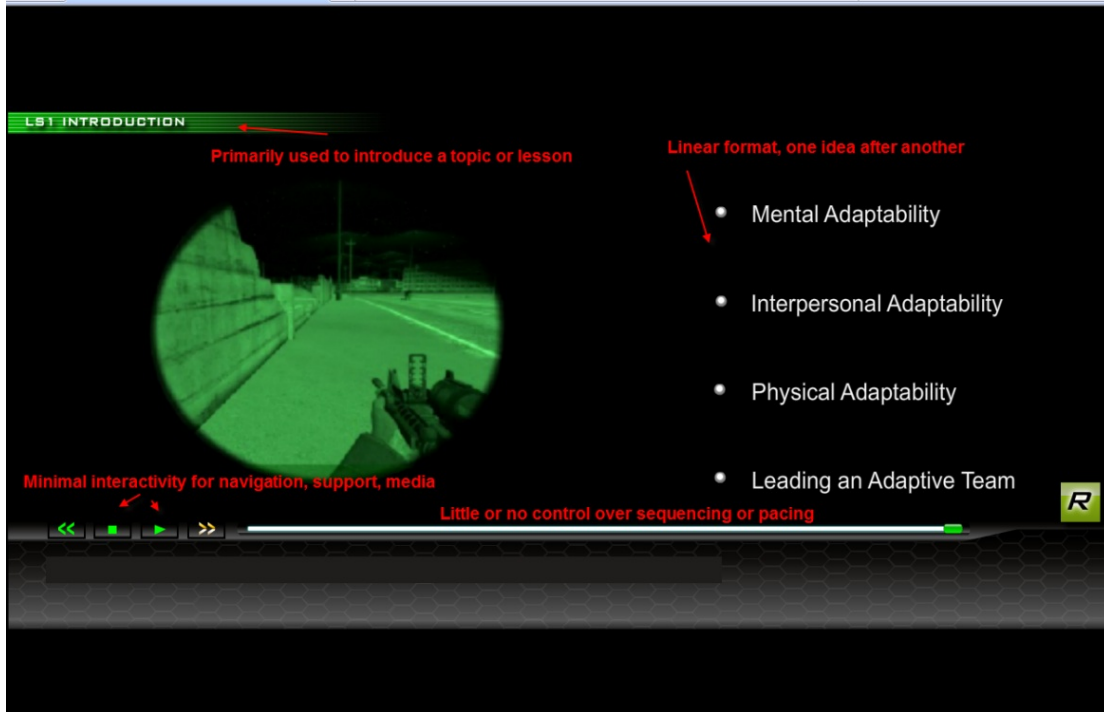
Figure 3-5. Category 1 high-grade simulation presentation

(g) The example in figure 3-6 is a category 2 medium-grade presentation. It has simple interaction, no instructional branching, and complex graphics.

Figure 3-6. Category 2 medium-grade presentation

(h) The example in Figure 3-7 is a category 2 medium-grade presentation. It has simple graphics, simulated interaction, no instructional branching, and some control.

Figure 3-7. Category 2 medium-grade presentation

(i) The example in figure 3-8 is a category 3 high-grade simulation presentation. It is a simulation of a process and has complex graphics, more control, and instructional branching.
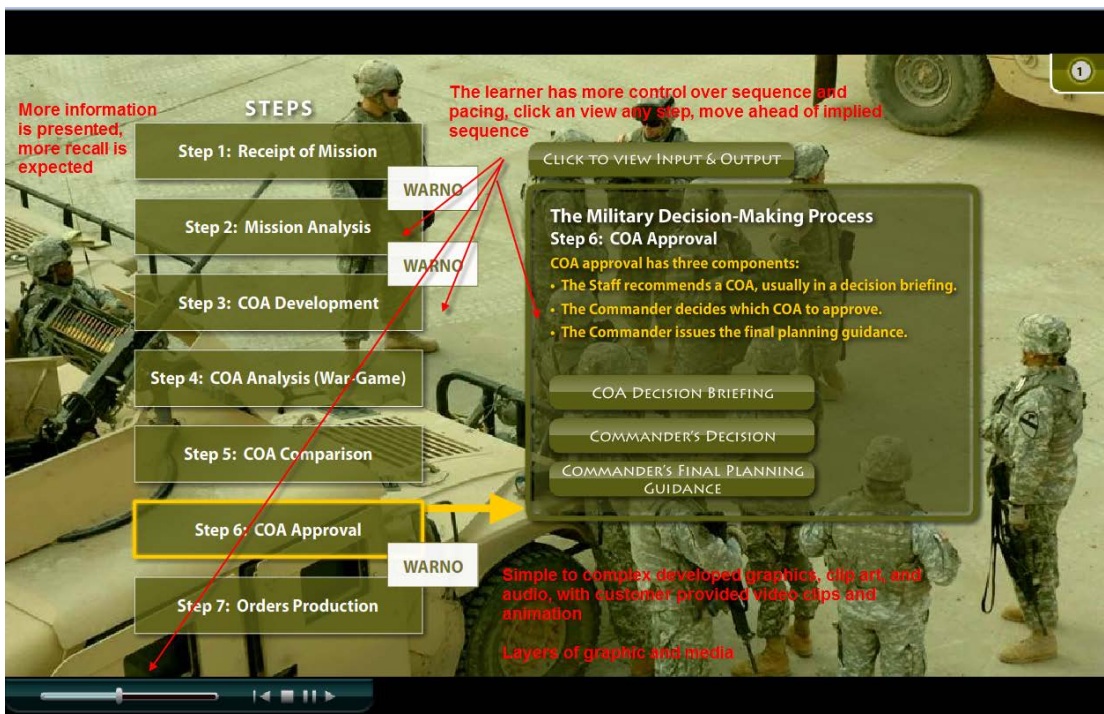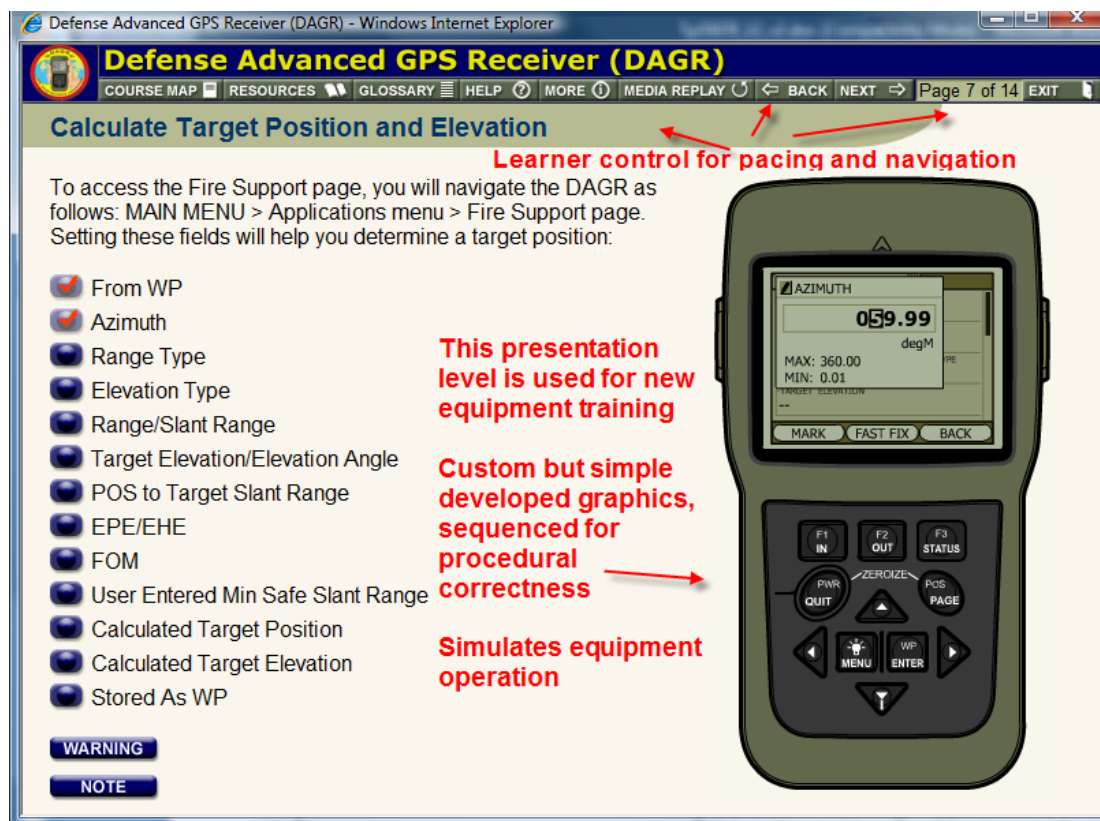
Figure 3-8. Category 3 high-grade simulation presentation

(j) The example in figure 3-9 is a category 4 high-grade simulation presentation. It is a real-time simulation and has complex graphics, real-time control, and instructional branching.

Figure 3-9. Category 4 high-grade simulation presentation

3-12. Planning for Sharable Content Object Resource Model (SCORM)-conformant content
SCORM-conformant courseware is not substantially different from any other type of courseware. It has, however changed to include smaller learning objects, or "chunks." Sharable content objects need to adhere to appropriate chunking, reuse, and reach-back abilities. This cuts down on the overall size of the courseware components. Also, SCORM requires two extra steps in the planning process:

   a. Plan the course. First, SCORM requires developers to think in terms of content that can be reused or repurposed. This can mean substantial savings in time and development costs. Analyze each component of the IMI (pre-assessment, an introduction, a knowledge-based presentation, a graphical diagram, post-assessment, etc.) for reusability. It is likely that a graphical diagram or a set of procedures may be used again. This analysis helps to identify dependent and independent content.

      (1) Prepare a course map. The course map assures that programmers can establish the correct instructional sequence and structure your content correctly in the LMS.

      (2) Develop courseware logic flow diagrams. With SCORM, flow diagrams are used to check the sequencing.

      (3) Establish sequencing and navigation. With SCORM, new functionality is offered to developers of SCORM content. While sequencing and navigation can be directed by the LMS, there is an exception. One new area of this functionality is performance-conditional branching. In this content design, a shareable content object (SCO) may contain a user interface device that allows students to trigger a navigation request. This means that developers may use a button or graphical image such as a forward arrow to direct students through course content separate from the navigation directed by the LMS.

   b. Search for reusable content. Second, when planning the course, search content repositories such as the Central Army Registry (CAR) for course content previously developed that can be reused in new courseware. Additional considerations in the planning process are the project's technical requirements, delivery platform (Army Learning Management System (ALMS), content management system, DVD-based, etc.), technical resources, course navigation, and sequencing.

Note: SCORM is not required for all IMI. If the reporting of test scores is not required, then the use of SCORM tagging for the content is not required.

3-13. Planning for accessibility — Section 508 of the Rehabilitation Act of 1973

   a. Section 508 of the Rehabilitation Act of 1973 requires each federal department or agency, when developing, procuring, maintaining, or using electronic and information technology (E&IT), to ensure that federal employees with disabilities to have access to, and use of, information and data that is comparable to federal employees without disabilities. In addition, members of the public with disabilities, who seek information or services from a federal department or agency, must have access to and use of information and data that is comparable to the access to and use of the information and data by members of the public without disabilities.

b. When development, procurement or maintenance of information or services imposes an undue burden, Section 508 alternatives will be considered that allow access to the information needed. .

c. The act exempts national security systems (as defined in the National Defense Authorization Act (Clinger-Cohen Act) for fiscal year 1996, Section 5142 (40 USC 1452)) from the provisions of Section 508. The Clinger-Cohen Act defines national security systems as telecommunications and information systems that involve:

(1) Intelligence activities.

(2) Cryptologic activities related to national security.

(3) Command and control of military forces.

(4) Equipment that is an integral part of a weapon or weapons system.

(5) A function or operation that is critical to the direct fulfillment of military or intelligence missions. This does not include a system used for routine administrative and business applications (including payroll, finance, logistics, and personnel management applications).

d. Electronic and information subsystems procured and operated under the distributed learning system comply with Section 508. Digital Training Facilities (DTFs) incorporate assistive technology devices and equipment, as well as ergonomic workplace solutions, when and as required, to assist developmentally or physically challenged individuals to accomplish effective computer use.

e. Unless an exception provided for by the Act applies, individual DL courses must comply with Section 508. Consult with TCM-TADLP (ATIC-IC) on the requirements of the planned course or content.

f. Courses selected for development are examined on a case-by-case basis to determine the applicability of Section 508. This examination results in one of the following outcomes:

(1) Course content is exempt from Section 508 IAW the Clinger-Cohen Act of 1996.

(2) Course content is provided to physically or developmentally challenged individuals through alternate means.

(3) Course content complies with Section 508 standards.

g. The standards established to comply with Section 508 are stated in terms of technical and functional performance criteria, as opposed to technical design requirements. Performance criteria give discretion in achieving the required end result. Section 508 and the standards build as much accessibility as is reasonably possible into general products that agencies develop, procure, maintain, or use. Not every computer is equipped with a refreshable Braille display, nor will every software program have a built-in screen reader. Agencies may require such assistive

technology as part of a reasonable accommodation for an employee with a disability, or to provide program accessibility.

h. The Architectural and Transportation Barriers Compliance Board (Access Board), an independent federal agency, published technical standards for E&IT accessibility in the Federal Register IAW Section 508. The technical standards are provided in appendix L.

3-14. Planning for IMI QC

a. Include a detailed process for performing quality control (QC) throughout the project to ensure a quality IMI product.

b. Follow these recommended steps to establish QC procedures:

(1) Establish a review and approval process for each IMI development product.

(2) Develop QC job aids (checklists).

(3) Assign QC responsibilities.

(4) Maintain continuous quality improvement.

c. Identify what needs to be reviewed, who will review it, and what criteria for improvement to apply.

(1) Determine the causes of the problem.

(2) Identify solutions to the problem.

(3) Implement the selected solution.

(4) Evaluate the results of the solution.

(5) Monitor the project's progress for continuous improvement.

d. Obtain approval of the outputs or products at each checkpoint.

e. Establish a review and approval process to make sure all products meet quality standards.

f. Ensure completion of review with an approval sheet. The review and approval sheet is filled out and attached to each component associated with a lesson (student handouts, ISAP, etc.). As the component is reviewed and approved, the approving authority signs the document. The document is completed for each component associated with the lesson. The primary author dates the sheet, telling the reviewer when the review is due for completion. Sign the sheet after all suggested corrections are made, checked, and approved. Components not approved are returned to the author for correction; checked again; and, if appropriate, approved.

g. Establish QC responsibilities for each member of the development team so that each member has specific review and approval duties. Table 3-5 shows the general QC responsibilities for each team member, and the importance of the review and approval.

Table 3-5
Development team QC responsibilities

Position title	Responsibility	Significance of review and approval
1. Developer	a. Authors an easy-to-understand lesson that is technically accurate and educationally sound, consistent with design documents. Reviews lesson components for instructional integrity and conformance with design documents. b. Validates lesson and components c. Ensure material meets any applicable criteria (for example, verb usage, assessment score requirements, and rubric availability) for accreditation (for example, TRADOC, ACE, COE, or IACET)	Lesson and components were reviewed and judged instructionally sound, satisfactory, and consistent with design documents.
2. SME	Reviews lesson and components for technical accuracy, currency, and completeness for doctrinal accuracy.	Lesson and components are reviewed and judged technically accurate, current, and complete.
3. Courseware programmer	a. Programs lessons according to design documents and instructions. b. Develops clear, easy-to-read graphics according to storyboard instructions.	a. Operational lesson was reviewed online and judged defect-free and operating as specified. b. Lesson was reviewed and static graphics were clear, animated graphics operated as specified, and correct video and graphics were called into lesson at the correct location and time.
4. Graphic imaging personnel	Develops clear, uncluttered, easy-to-see graphics, according to storyboard instructions.	Online graphics were reviewed and judged correct, clear, and easy to see.
5. Media specialist	Develops high quality, clear video according to short list and storyboard instructions.	Video was reviewed and judged of high quality.
6. Project manager	Reviews and approves lesson and components for instructional integrity and conformance with design documents.	Lesson and components were reviewed and judged instructionally sound and consistent with design documents. Operational lessons are user-friendly and consistent.

h. Report discrepancies. QC procedures should also provide a means to document discrepancies. Record discrepancies in the IMI, identifying the reviewer, review date, product type, discrepancy report number, lesson name, and discrepancy location. Provide space to describe the discrepancy, suggest corrective actions, and resolve the discrepancy.

i. Conduct initial reviews. Conduct an initial review upon completion of the first topic that would include all lesson components. This review is to ensure conventions are being followed, strategy is acceptable, and there is a correct combination of text and graphics. The developer should make all necessary changes to the lesson. Two experienced developers and the team leader should review the first topic. Depending on the amount of review comments, the topic may require reviewing again.

j. Conduct team reviews. Developers should review their lessons and make all changes. The developers' review is all encompassing, checking every branching point, and every assessment item. Only when the developers are sure that everything is working in the lesson should they give it to anyone else to review. Reviews by developers and peer/team leaders are included as an integral part of the lesson development timeframe.

k. Review. Hold review comments until input from all team reviews are incorporated at one time. Incorporate all team review changes before sending to the SME for technical or doctrinal review.

Chapter 4
Analysis
The nature of the CAPDL contract vehicle, firm fixed price, puts a premium on knowing what you want to produce when the content is nominated. For this reason, front-end analysis and due diligence are of the utmost importance. Consider also whether the need addresses a Joint need, for there may well be a Joint training product already developed.

4-1. Analysis overview
The analysis phase of the ADDIE process is used to determine whether there is a need for creating learning products, or whether a non-training solution such as a job aid is more appropriate. During the analysis phase the instructional problem is identified; the target audience characteristics are determined; desired outcomes are established; existing knowledge of the students is reviewed; content, context and media are considered; and an evaluation plan is developed.

4-2. Needs analysis
A needs analysis is the process used to determine "what is needed" to solve or mitigate gaps between current and required Army capabilities. Some circumstances that might prompt an analysis include but are not limited to the following: evaluation findings, input from the field, emerging doctrine, identified leadership deficiencies, organizational changes, and materiel or system modifications. It is important to determine whether other agencies have developed learning product solutions that address the perceived gap in knowledge or performance before pursuing the development of a new learning product.

4-3. DL analysis

The decision to use DL requires further analysis to determine the appropriateness of this approach. DL content should be stable, should not be required immediately, and should be required by a diverse or physically dispersed audience. DL should be used for content that does not require smell or touch, although newer technology may incorporate these senses in the future. The method of student assessment is another factor to consider when determining whether DL is appropriate.

a. Stable content. High-end DL content usually requires time to develop. This means long development time and usually higher costs. For this reason, content planned for this type of development should be stable and not be subject to change.

b. Target audience analysis. Analysis of the target audience for DL is not unlike the analysis for resident courseware. The analysis must take into consideration the age, education, reading level, and experience (job assignments) of a typical student who will be using the learning content. Army audiences can be described with MOS and skill level but information must be provided in greater detail. Focus should be placed on the range of individual qualifications and all the relevant physical, mental, physiological, biographical, and motivational dimensions of the students who will be using the developed content.

c. Use of all senses. If the analysis determines the requirement for either a sense of smell (olfactics) or a sense of touch (haptic), then DL may not be the best choice. Newer technology may offer solutions to this dilemma in the future.

d. Evaluation of DL. Evaluations, as part of the learning model in TP 525-8-2, ensure learning occurred to standard and that the course is still meeting the needs of the Army. Post-instruction surveys allow both students and their supervisors to give the developer feedback that learning occurred to the standard prescribed in the course. Survey results may be collected electronically and compiled to provide quick response to curriculum change. In addition, direct job observation and graduate interviews can provide valuable evaluation data.

(1) Degree of instructor/facilitator involvement. Developers must also determine whether instructor/facilitator involvement is desired and if so, how and how much is required. TP 525-8-2 places strong emphasis on the use of blended learning. Blended learning is defined most frequently as online or technology-delivered instruction combined with face-to-face instruction. It blends efficiencies and effectiveness of IMI with the expert guidance of an instructor/facilitator, and can include the added social benefit of peer-to-peer interactions. When developing courseware, it is most important to understand the role of the intended courseware by considering the level of involvement instructors/facilitators will have with students.

(2) Content chunking analysis. Content developed for delivery across the Web cannot use the same design paradigm used with CBT. It must be delivered in small chunks, easily handled by an LMS, and easily managed by the students. It must be optimized for the Web requiring modest bandwidth without sacrificing quality. Chunking has been defined as decomposing content into the smallest intelligible chunk so that the parts can be woven into differing learning structures. The parts can be a lesson, module, or even a complete course. They can be chunked based on topic, time, task, or other factors. They can be thought of as all the parts and pieces of

a course but without the structure that links them together. The process of chunking content can lead to efficiency and effectiveness in the delivery of the content and, ultimately, can provide the components of adaptive learning products.

(3) Once the pieces are identified, they are developed as stand-alone "topics" not linked or sequenced in any way. This linkage will take place once the topics are loaded into an LMS. The course structure starts to take place with modules and prerequisites all defined within that space. Figure 4-1 depicts a course structure example.
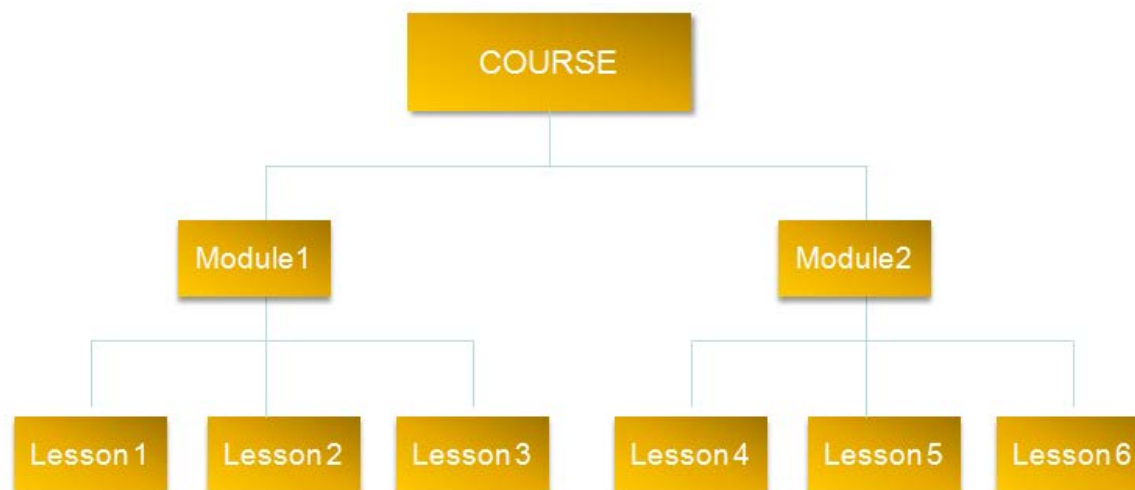
Figure 4-1. Course structure example

(4) The end goal is that each content chunk should be an independent learning object so that the LMS/content management system renders only what is required in the chunk or lesson.

(5) Chunks should be relevant and coherent and the cognitive duration of a chunk should be limited in the number of steps or to a specific time-span. The chunk should be self-contained, meaning that it should be an independent learning object.

(6) All DL courseware should be developed with reusability in mind. By creating smaller chunks of content and appropriately identifying those chunks through the use of metadata, the likelihood increases that a chunk will be reused in another learning context. Bandwidth limitations of Army and mobile networks have further necessitated chunking of courseware content. Figure 4-2 depicts how lessons become topics when the structure is left to the LMS.

Figure 4-2. Lessons become topics in computer managed instruction (CMI)

4-4. SCORM analysis
Part of the analysis of content requires consideration of the SCORM standard.

a. SCORM is a packaging and communication standard for Web-delivered content. Packaging refers to the standard followed when compressing the content into a .zip format. SCORM uses the package interchange file extension.

Note: The important thing to remember about SCORM is that it is for Web-based courseware. If it does not need to play on the Web, it does not need to be SCORM-conformant.

b. SCOs are reusable learning objects that can be launched and tracked by communicating with an LMS. It is this communication with an LMS that makes a SCO. Without this, an SCO is just a collection of assets (pictures, video, text, and audio). SCOs should be developed to support specific instructional objectives. An entire course could be an SCO if there is no instructional reason to break it into smaller pieces.

c. There are limitations inherent in SCORM that can influence DL development decisions. SCORM specifications allow the content to communicate with an LMS but not with other content. This limitation ensures the content can be discovered and reused in other courseware.

d. Another important consideration for the development team is the concept of SCO dependence. To improve reusability, a SCO should be designed independent of learning context. To attain this freedom from content, SCOs are usually formed from the smallest part of learning content (for example; an animation depicting electrical troubleshooting instead of the complete lesson in electrical diagnostics). The complete lesson may have references too specific for other developers to use. A SCO is considered dependent if the graphic design elements or the sequence and navigation design are tied to a specific context or content.

e. Learning content is generally developed as courses, modules, or lessons — each full of resources such as animations, simulations, graphics, video, and audio. New technical standards

were developed to open these resources to discovery and reuse. These standards allow for separation of all the pieces of learning content, making it available to other developers. Reusable learning objects are small chunks of learning content that can be tagged with descriptive labels (metadata) and made discoverable by other developers. Other benefits include the ability to:

    (1) Use existing content to create new courses for all government agencies.

    (2) Use multiple delivery channels (Internet, intranet, print, etc.).

    (3) Provide efficient and cost-effective content revisions.

    (4) Improve course development efficiently in a timely manner.

    (5) Assemble new courses and other deliverables from existing content, in whole or in part.

Note: For a full discussion of SCORM see appendix E, SCORM.

Chapter 5
Design

5-1. Design overview
During the design phase of the ADDIE process, information collected in the analysis phase is used to develop details about when, where, and how desired learning outcomes are achieved. Terminal learning objectives (TLOs) and enabling learning objectives (ELOs) are identified and course structure and sequencing are considered. It is during the design phase that storyboards are assembled, instructional strategies are selected, and assessment plans are developed. Outputs from the design phase are used to provide the framework for the development phase.

    a. This paragraph identifies fundamental principles for DL courseware and provides a goal for proponent schools to achieve in designing effective and efficient courseware. These principles are not hard and fast rules; rather, they provide guidance for developers to follow in applying their own imagination, creativity, and intuition to the courseware design process. Proponent and contractor developers and quality assurance /quality control (QC) reviewers should follow this guidance.

    b. Establish the interaction of students with the courseware. This is a key factor in both the cost and effectiveness of IMI. Appendix D describes four levels of interactivity ranging from low-level to real-time simulations. Proponent schools specify the required level of interactivity in SOWs developed for contractor support.

    c. Address the fundamental requirements of adult learners, which are to:

    (1) Comprehend why they should learn what is taught.

    (2) Direct their time and activities.

(3) Share their experiences.

(4) Use what they have learned.

(5) Use a problem-centered approach to learning.

(6) Have confidence in their ability to perform the skill or task taught.

   d. Motivate students:

(1) Design DL courses to grab the students' attention and stimulate curiosity within the first 2 minutes of instruction.

(2) Communicate to the students why they need to know what is being taught.

(3) Influence the students' attitudes concerning the subject and identify what they should know or do.

   e. Give students control. Whenever possible, allow students to:

(1) Branch to different sections, exit a lesson and reenter at a specific segment of instruction, and move backward in the lesson for review.

(2) Manage the pace of presentation.

(3) Choose from among PEs and optional assessment questions.

   f. Involve students with active, meaningful instruction. (See appendix D, Student Control, Navigation, and Interaction, for further details).

(1) Actively involve students during the middle of the instructional period (when recall is at its lowest point) by including a mix of student-student, student-content, and student-instructor/facilitator interactions.

(2) Involve students in role-playing scenarios, problem solving, and case studies designed to grab and hold attention. Follow the experience with periods of reflection that ask the questions, "What did I learn?" and "What will I do with it?"

(3) Provide feedback that:

(a) Is prompt.

(b) Is frequent and available when the student needs it.

(c) Tells or shows why a response was correct or incorrect.

(d) Indicates improvement since the student's last assessment.

(e) Is followed by new action.

g. Use the following DL course design techniques to illustrate, demonstrate, or visualize learning objectives by:

(1) Using graphics, pictures, animation, or video to illustrate or demonstrate action, rather than using text or a talking head.

(2) Using animation to demonstrate processes that are difficult to visualize from verbal descriptions, or are too costly, too dangerous, or impractical to video.

(3) Using video to demonstrate procedures requiring motion and stimulate critical thinking and discussion.

(4) Triggering image visualization by telling stories, relating examples of action, and using analogies.

h. Use the following course design guidelines for presentation.

(1) The letter font and size combination is the most important attribute of text legibility on video displays. Use light to medium-colored backgrounds with a text color that yields a text-to-background contrast ratio in the range of 8:1 to 10:1 to enhance legibility.

(2) Pleasing colors on a video display include any shade of medium blue background with white or yellow text. Other desirable medium-tone background shades include green, salmon, medium purple, gray, and tan.

(3) Combinations of complementary colors of the same value are difficult to read and are annoying to viewers. Examples include blue/orange, red/green, and yellow/violet. Avoid combinations of red and green because male-pattern color blindness is most prevalent in distinguishing between these two colors. See appendix L for guidance on Section 508 compliance for assisting individuals with disabilities that would impede regular access to DL instruction.

i. The following techniques provide structure to the learning experience. Ensure DL courseware designs:

(1) Introduce the lesson by presenting its full context. In other words, explain what came before, what comes now, what comes next, and why this subject is important.

(2) Have consistency between the learning objective, the lesson content, examples, exercises, and assessment items, to build student trust and confidence in the course materials.

(3) Improve student performance on comprehensive post-assessments by beginning lessons with recall pre-assessments (essay exam, fill-in-the-blanks, and matching). Performance on recall pre-assessments often exceeds those involving recognition, that is, multiple-choice exams.

(4) Relate the learning objective to the context of the total subject. Present instruction using a whole-part-whole sequence to result in quicker learning than presentations that use a part-whole sequence (in other words, starting with details and building to the general topic).

(5) Begin the lesson with a practice session that calls for a response to a situation. End the lesson with a discussion of the theory involved.

(6) Provide indicators of where the student is in the lesson and in the course to reduce problems that occur when DL students lose track of their place in electronic instruction.

(7) Include periodic review sessions, such as after an hour, a day, a week, or a month.

(8) Conclude the learning experience by providing for a transfer of the knowledge, skill, or task learned to the students' jobs.

5-2. Instructional media design package (IMDP)

a. In designing the learning product, some key decisions are needed early in the process in order to assure the right set of technical standards are applied and followed.

b. The IMDP provides a blueprint to guide the developers through this complex process. It should be part of the in-house development process and is a required part of contracted work. The IMDP:

(1) Is prescribed by data item description DI-SESS-81520B.

(2) Provides a summary description of the content.

(3) Identifies the sequence of learning objectives.

(4) Provides a course overview.

(5) Prepares the DL design specifications.

(6) Provides a method to obtain school management review and approval.

c. The IMDP is a demonstration of the plan to develop courseware. The goal should be a clear description of the proposed course design and delivery method. The IMDP should demonstrate an understanding of instructional design, of the instructional goals of the lessons, and a plan to implement the goals with sound delivery methods. The IMDP:

(1) Provides reviewers a chance to visualize the plan before the start of development.

(2) Offers reviewers and developers a platform for discussion of the development plan.

(3) Provides a way to make changes that will not affect work already completed.

d. Components of the IMDP process are in appendix I and are prepared IAW military performance specification (MIL-PRF)-29612B.

e. The IMDP components template was developed to assist reviewers of courseware in completing a structured review of either contracted or in-house development. The template is self-explanatory and only requires the reviewer to check a GO or NO GO in answer to the items on the list. This template is available for download and use from the following Web site: http://www.atsc.army.mil/tadlp/content/index.asp.

5-3. Content chunking design

a. TP 525-8-2 describes the continuous adaptive learning model that engages students with adaptive learning support systems. These provide a tailored learning experience based on the student's personal competence levels. "Adaptive learning, intelligent tutoring, virtual and augmented reality simulations, increased automation/artificial intelligence simulation, and massively multiplayer online games, among others, will provide Soldiers with opportunities for engaging, relevant learning at any time and place." Each of these systems offers a digitized learning product that, when combined with other relevant content, can be used to meet specific learning outcomes. A good example of this concept comes from the scenarios developed for serious game play. These digitized objects are available for integration into a number of learning products. The vignettes provide engaging action, high fidelity graphics, and relevant scenes. The reuse and repurpose of these scenarios provides cost savings and efficiency in the development process. As these and other small chunks of content are developed, the TP 525-8-2 vision of digital learning content farms is realized.

b. Good instructional design starts with a strong analysis phase. This phase provides an opportunity to look at the parts and pieces that make up a course and decide on a chunking strategy. One way to accomplish this is to think of each task as a chunk. For education-related courseware, use a topic to teach the content.

c. Each task or topic should be self-contained, meaning all the material needed to teach the task or topic is part of the chunk. The introduction, lesson, and summary all form one chunk, typically 15-20 minutes in length. The content should be relevant and coherent. Do not leave anything out that is needed for clarity. Remember, this chunk may be used in different courses, so this is important.

d. The chunk might contain a complete procedure or part of a procedure that can be used with other courses. For example, the task Assessing Shock may contain the lesson complete with all procedural steps and a video to demonstrate what right looks like. The chunk then can be used as part of a first aid course for infantry Soldiers and a different first aid course for artillery Soldiers.

e. Chunking is greatly facilitated by working with the content SMEs. These experts can help break down content into relevant parts. You may want to teach the components of a system before teaching the complete process, or separate supporting knowledge from procedural steps.

5-4. Mobile learning: Learning with a mobile Internet device
The guiding principle for designing mobile learning content is simply that it should not be about learning mobile. By emphasizing the use of sound teaching and learning practices, the end result will be reflected in the performance outcomes of the students and in their satisfaction with the

instructional event. The delivery platform should be included in the overall design of the instruction and the final implementation, but it should not guide the process. Implementing the best teaching and learning practice requires an understanding of how the student will access and use the instructional content.

a. The decision to include mobile delivery of learning content requires careful consideration of the following issues:

(1) Content: what is the best way to ensure learning objectives are met? This is best answered in the design of the learning content following traditional methods for selection of media.

(2) Credit: does the content produce credit? Does the student need to be tracked and scores recorded?

(3) Multimedia: how much is needed and at what level of speed and fidelity? Many devices are available on the market with varying answers to this question. What is the data transmission speed and is it enough to ensure smooth resolution and required fidelity?

(4) Interaction: how much and with whom? Does the learning objective require peer or instructor/facilitator interaction?

(5) User degree of interactivity: what is the user doing? How much speed, resolution, and feedback are required?

(6) Length of learning event: will there be enough battery power to support the length?

(7) Delivery location: what is availability of third generation or fourth generation network?

(8) Device: who owns the device (Army or the user)? How are minutes accounted for? Who pays for over-use? If the Army owns the device, then there are three (possibly four) choices, but if user owns the device, then the field is overwhelming.

b. Mobile learning centers around three basic approaches:

(1) Standardized content delivered to a mobile device that is tracked and recorded by an LMS or student information system.

(2) Native content developed to support learning just in time in the field.

(3) Executable applications that provide learning exercises such as gaming or quizzes.

5-5. Assessment strategies

a. Pre-assessments allow students to skip content that has already been mastered.

b. Post-assessments can be used as a metric to measure learning.

c. Diagnostic pre-assessments are used to determine what knowledge students already possess and to structure the learning experience around content that has not yet been mastered. This is commonly referred to as branching.

d. Diagnostic post-assessments allow remediation. If students fail on certain learning objectives in the post-assessments, they will be redirected to remediation for the objective that was not mastered. Diagnostic post-assessments provide control over the sequence of remedial lessons or learning objectives based on student performance.

e. Mastery assessments are designed to determine the level of knowledge and understanding that a student possesses once content has been completed. Mastery assessments measure the final student outcome of training/education provided in the courseware.

5-6. Assessment in IMI
When designing IMI courseware, the instructional pathway through the student content will be dependent on the assessment strategy that is chosen. This provides sequencing of content and a framework for lesson design. One of the following assessment strategies can be selected when designing IMI courseware:

a. Simple course structure: this is linear lesson sequencing without an assessment.

b. Optional mastery pre-assessments: this is linear lesson sequencing with assessment(s).

c. Mastery pre-assessments and two post-assessments: this is linear lesson sequencing with two post-assessments.

d. Diagnostic pre-assessments: this is linear lesson sequencing based on diagnostic pre-assessment TLO/ELO results with two post-assessments.

e. Diagnostic mastery post-assessments: this is linear lesson sequencing with diagnostic post-assessments at TLO/ELO level.

5-7. Storyboarding

a. The designer uses storyboards to explain concepts and gain approval. With contracted design, the storyboard is provided by the contractor's design team.

b. Storyboards provide a textual and visual description of content, graphics, animations, and other media elements. The storyboards are based on the content that has been outlined in the IMDP and provide a visualization of the instructional plan, organization, and sequence of the Web-based or CD-ROM instruction.

c. Storyboard information should coordinate the lesson plan text with associated visuals, show the sequencing of visual information, and provide directions for development and programming/coding. The information and descriptions provide a blueprint for the development team to reduce or eliminate assumptions, questions, or confusion about the final product.

d. The components of a storyboard depend on the type of application, complexity of the lesson, and levels of documentation required. A storyboard page represents one IMI screen. See figures 5-1 and 5-2 for different storyboard layout options.

Screen Number:
Title:
Type:
Back:
Forward:
Content:
Narration:
Notes:
Template:
Date and Version:

Figure 5-1. Storyboard version 1

Course Title:		Module #	Lesson #	Screen #
Lesson Title:				Next #
Screen Title:				Back #
Display Area:				Narration/Script:
				Graphic Artist / Videographer Notes:
				Programmer Notes:
				Branching:
				Additional Information:
Version:		Date:		Page #

Figure 5-2. Storyboard version 2

(1) Storyboard templates generally have four sections:

(a) Header.

(b) Display area.

(c) Notes panel.

(d) Footer.

(2) The storyboard header usually contains:

(a) Course title.

(b) Module number (if applicable).

(c) Lesson title and number.

(d) Screen title and number.

(e) Next screen number.

(f) Back screen number.

(3) The storyboard display area contains:

(a) Text (including hyperlinks and pop-up text).

(b) Visual elements (actual or placeholders that indicate size and location on the screen).

(4) The storyboard notes panel contains the following (if applicable):

(a) Narration/script (the complete text of any audio for the screen).

(b) Graphic artist/videographer notes.

(c) Programmer notes.

(d) Branching (describes hotspots and lists the screen number the student will see after clicking each one).

(e) Additional information (correct answer, final feedback correct, final feedback incorrect, remediation page navigation, etc.).

(5) The storyboard footer usually contains:

(a) Storyboard version.

(b) Date.

(c) Page number within the storyboard document.

Chapter 6
Development

6-1. Development overview
The development phase is the process of converting outputs from the design phase into a finished learning product. For DL, this is the process of moving from an accepted IMDP to actual development of the products contained in the plan.

6-2. Course structure
Using the storyboards completed in the design phase, the first step of development involves building the course structure. How will the student move through the course or curriculum? What are prerequisite lessons? Does it make sense to force the student through the content or can control of sequencing be left to the student?

   a. The course map provides the visual that allows all members of the development team to see the design. The course map provides:

      (1) Course structure.

      (2) Course flow.

      (3) Prerequisite steps.

      (4) Remediation paths.

      (5) Instructional branching.

   b. Figure 6-1 is a course map example.
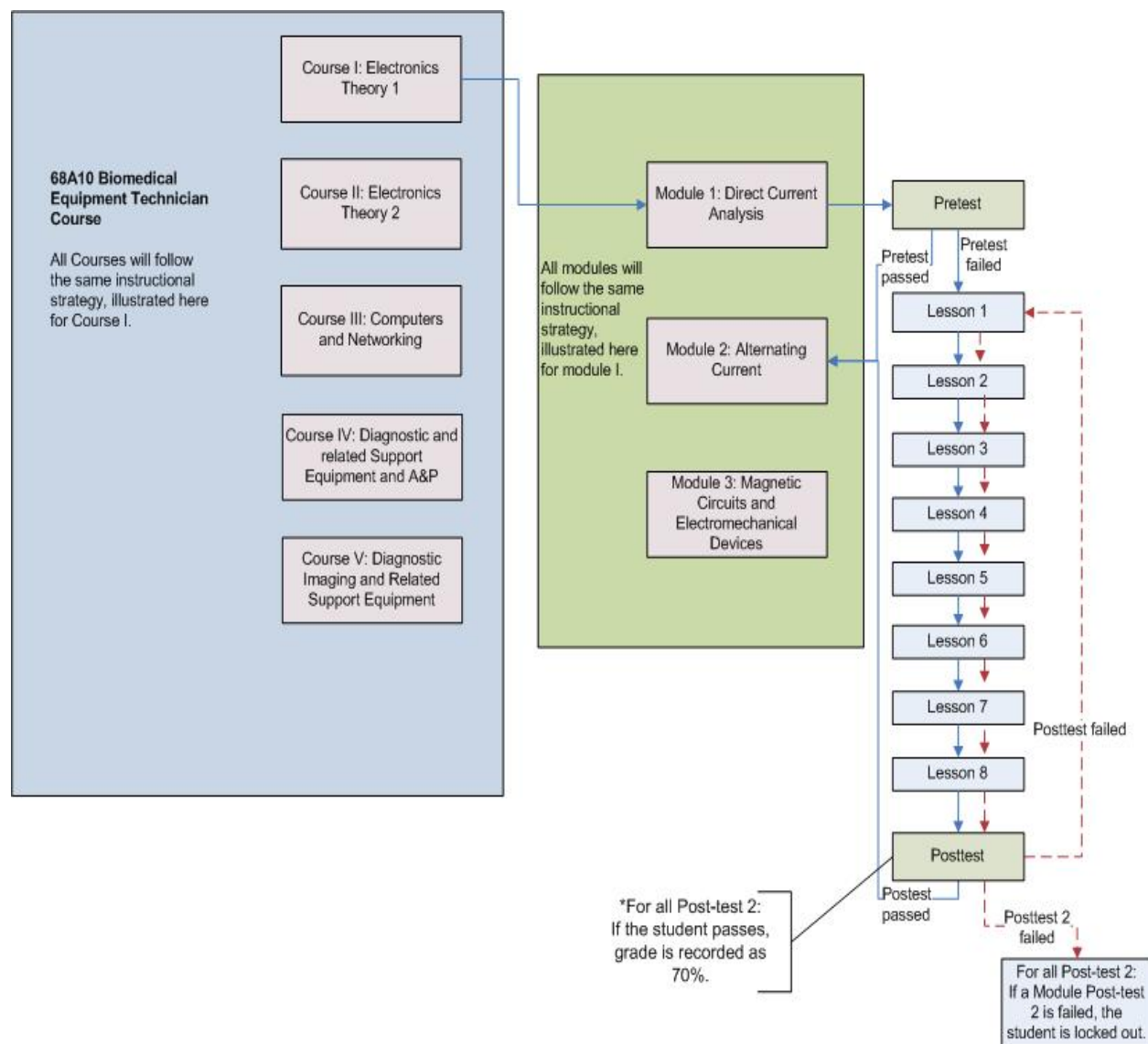
Figure 6-1. Course Map Example

c. When developing DL, developers may use a mixture of instructional techniques and delivery media. These may be delivered to the student in a variety of timed events. For example, there may be a pre-resident phase in which the student is required to read materials in preparation for the resident phase. There may be a post-resident phase in which content is available for a refresher or sustainment of gained skills and knowledge.

d. Course structure is usually provided by the LMS. Within the system, prerequisites, read-ahead material, and even material for refresher training can be stored.

e. Learner-centric designs may leave the structure to the student. This means access to the material, the sequence, and the pace at which it is accessed is left to the student.

f. Careful planning in the design phase can help make decisions about course structure. For example:

(1) SCORM. Course structure is defined within the manifest of SCORM content. The manifest is like a set of directions that tells the LMS how and when to make content available to the student. The individual chunks can be SCORM without the course structure and this is preferred, as all Army LMSs can provide course structure. Using SCORM for course structure is only advised with certain types of delivery options such as complex sequencing and navigation based on diagnostic assessments. See appendix E for a full discussion of SCORM.

(2) Assembling content chunks into courses. During the development phase, think in terms of content or learning objects, rather than courseware or course. Content should be optimized for Web delivery and file sizes should be kept to a minimum. The LMS will provide navigation and tracking capabilities, so consider whether or not content needs to be SCORM conformant. Simple SCORM, or the asset plus an Instructional Management Systems (IMS) manifest, can be used in situations where complex navigation or tracking is not needed.

6-3. Content structuring and sequencing for delivery on the Army Learning and Content Management Capability (ALCMC) platforms

a. An LMS is a Web-based information system that delivers learning content, manages learning information, provides learning collaboration, scheduling, and career planning capabilities in both resident and non-resident courses. An LMS provides the following capabilities:

(1) Registering and enrolling students.

(2) Monitoring assessments and student progress.

(3) Distributing, delivering, storing, and presenting learning products.

(4) Maintaining training/education records.

(5) Providing collaboration capabilities for both the student and instructor/facilitator.

(6) Collecting and storing feedback and evaluations.

(7) Maintaining a database of learning products and resources.

b. A learning content management system (LCMS) is very similar to an LMS with one major difference — an LMS is capable of managing both classroom and e-learning and usually does not provide a course authoring capability except as part of a larger suite of tools. An LCMS is focused on course delivery and management of that process. It offers a course manager greater flexibility in structuring the course as well as authoring course items such as threaded discussions and exams.

c. SCORM-conformant courseware can be delivered on either an LMS or an LCMS but there may be adjustments required. See appendix E for a full discussion of SCORM.

6-4. Instructional strategy (technical implementation of assessment strategy)

a. For Web-based SCORM-conformant IMI courseware, the following design strategies or wireframes may be used:

(1) Strategy 1: linear lesson sequencing without assessments. This is a simple course structure with linear sequencing from one lesson to the next. There are no pre-assessments or post-assessments and linear sequencing is used between ELOs within the lesson.

(2) Strategy 2: linear lesson sequencing with assessments. This is a simple course structure with optional phase/module level mastery pre-assessment and a single phase/module level master post-assessment. There is one attempt on the post-assessments and no remediation is given.

(3) Strategy 3: linear lesson sequencing with two post-assessments. This strategy contains an optional phase/module level master pre-assessment and two phase/module level mastery post-assessments. There is one attempt for post-assessments one and two. There will be remediation back to all content upon failure of the first post-assessment.

(4) Strategy 4: diagnostic master post-assessment structure. This strategy contains a mastery phase/module level pre-assessment, linear sequencing between lessons, a single diagnostic post-assessment with unlimited attempts, and remediation back to failed objectives.

(5) Strategy 5: diagnostic mastery phase/module level pre-assessment. The sequencing in this strategy is based on pre-assessment performance. Branching within the lesson is based on student performance in checks-on-learning. There are two mastery level post-assessments with a single attempt at each and no remediation.

b. For other delivery models, a wireframe may not be required. Consult with TCM-TADLP (ATIC-IC) for more information.

Chapter 7
Implementation

7-1. Implementation overview

a. The course implementation plan describes how the content will be delivered. DL leverages various technologies and delivery techniques to distribute instruction to students. An essential element of the DL courseware and content development process is to select the most effective technique to present the learning products. As communications capabilities and multimedia technologies constantly evolve, TADLP will incorporate state-of-the-art delivery technologies that are cost and instructionally efficient to satisfy operational requirements.

b. Computer-based instruction (CBI) usually refers to IMI courseware delivered via WBT or CD-ROM. These courses employ techniques that require frequent student interaction with the courseware as a means of facilitating learning. CBI includes both individual and group-paced interactive instruction combined with multimedia presentations. Interactive instruction is

learner-centered, performance-based instruction that requires students to practice what they learn, receive immediate feedback on their performance, and take assessment(s) on the material. Students' performance is measured using criterion-referenced assessments. CBI maximizes individual or group learning through the use of multiple instructional methods. It allows students to practice learning steps/activities (LSAs) and tasks without injuring personnel or damaging equipment. Students may progress through the learning content at their own pace, repeating lessons until they achieve the established performance standards.

c. Web-based, SCORM-conformant, asynchronous or synchronous, self-paced IMI should be selected when all lessons/tasks in a course are going to be delivered as Web-based, self-paced instruction. This courseware supports credited mandatory training, credited self-development learning products, and refresher/sustainment training. It can also support the delivery of a DL phase prior to a resident course.

d. Web-based instructor/facilitator in the loop, synchronous or asynchronous (Webinar, video, collaboration, virtual classroom, and demonstration) instruction includes the cohort model. This implementation plan should be selected if the delivery method will include a virtual classroom (LMS/LCMS) to supplement resident face-to-face instruction by providing student materials, student-to-student collaboration, threaded e-mail forums, and/or a digital drop box for assignments.

e. Virtual classrooms provide instructor/facilitator-led assignments, conduct or facilitate discussions following specific lessons, provide additional assignments, track progress, mentor students or encourage student motivation. The cohort model is designed to allow a group of students to work together to meet their learning objective. Cohort model students must adhere to a more rigid course schedule with specific start and end times for completing blocks of Web-based asynchronous IMI content. This allows the instructor/facilitator to conduct or facilitate discussions following specific lessons, provide additional assignments, track progress, and ensure students stay on schedule. The typical cohort model is DA-directed training with students accessing the Web-based IMI courseware while in a DTF, at home, or in the office. The student enters the courseware through the LCMS or Army Knowledge Online (AKO). The IMI trains the basic foundation of a task/TLO. The instructor facilitates discussions, provides references, and assists students who are having courseware problems. Student tracking and record keeping is required for the IMI phase.

f. This implementation option might also be used within a virtual classroom using a combination of synchronous or asynchronous collaboration. The instructor/facilitator can include a virtual workspace allowing students to work together. This option includes review of IMI, map exercises, document editing, brainstorming, video and audio exchange using voice over Internet protocol, and desktop sharing.

g. The virtual classroom might also be used in instances that are non-credit producing for delivery of Web-based, synchronous, informal presentation of information, instruction, or mentoring. The instructor/facilitator is in one location providing this information to a small number of dispersed students.

h. Computer or Web-based simulations and/or gaming courseware is delivered on CD-ROM or DVD. It can be highly interactive courseware, or it can be a computer-based simulation that plays best in this media. It may also be a game used as a practice environment for mission rehearsal or unit training.

i. VTT provides the means to deliver simultaneous instruction to a wide audience of students at geographically dispersed locations. Present the content using different methods of instruction including instructor/facilitator-centered lectures, videotapes, demonstrations, and group exercises. VTT allows the proponent school or One Army School System training battalion to:

(1) Increase class sizes.

(2) Reach students in remote locations, including locations outside the continental United States.

(3) Reduce travel and per diem costs.

(4) Provide critical, short-notice training.

(5) Originate instruction from any network link.

(6) Conduct joint, multiservice, federal, and civilian courses.

(7) Link with other DoD, government, and private sector training networks.

(8) Provide standardized quality instruction.

(9) Allow interaction between geographically separated instructors/facilitators and students.

j. Simulation systems offer realistic training in a safe, efficient, and effective manner. They offset the restrictions imposed upon live training and the use of high technology weapons systems that result from safety considerations, environmental sensitivities, and higher training costs. The DoD groups simulation technologies into three classes:

(1) Virtual simulations, which network simulators to support team and unit collective training on a simulated battlefield. They may include links to live or constructive simulations. Examples include the Simulation Network and the Close Combat Tactical Trainer.

(2) Constructive simulations, which include networked interactive computer models to conduct war games that include human input. These simulations support command and control training and integrate combat arms, combat support, and combat service support functions from platoons and companies to echelons above corps. Examples include the Janus battle synchronization trainer for platoon and company-level officers, the Brigade/Battalion Battle Simulation, and the Corps Battle Simulation.

(3) Live simulations, in which combined arms and services' field training exercises involve actual combatants, using real or surrogate systems, operating under the most realistic

combat conditions attainable. Examples include force-on-force exercises conducted at home stations and the maneuver combat training centers using instrumented weapons, and the conduct of gunnery tables using the Tank Weapons Gunnery Simulation System and Precision Gunnery System. These exercises simulate the casualty-producing effects of modern weapons in a safe, objective, and efficient manner.

    k. Embedded training (ET) refers to training capabilities that are built-in, strapped on, or plugged into new or improved Army systems. These capabilities support training strategies required to introduce, operate, and sustain equipment and its software. They also support training required to teach doctrinal and tactical applications of the systems. The goal is for ET to link geographically separated units within a common operating environment in virtual, constructive, and live simulations. ET provides user assistance, emulation or simulation of operating and maintenance features, connections between the prime system and the training system, and training instrumentation.

7-2. Choosing an implementation platform
Table 7-1 contains information regarding the course characteristics that should be used to identify the LMS or LCMS destination best suited for a course. The criteria do not constitute concrete rules, but rather characteristic-based guidance.

Table 7-1
Implementation platforms

Course characteristics	LMS	LCMS	LCM and creation system
1. Certificate required.	✓	✓	✓
2. Required and/or credit-producing training.	✓	✓	✓
3. Collaboration tool.	✓	✓	✓
4. Learning products containing a valid assessment or other measurement instrument.	✓	✓	✓
5. SCORM-conformant content (v2004 4th edition and earlier).	✓	✓	✓
6. Aviation Industry Computer-Based Training Committee or partner software content.	✓		
7. Non-SCORM conformant content.	✓	✓	✓
8. Self-development learning product.	✓	✓	✓
9. Resident learning product.		✓	✓
10. Blended learning product.		✓	

Table 7-1
Implementation platforms, continued

Course characteristics	LMS	LCMS	LCM and creation system
11. Instructor facilitated learning product (requires drop box, grade book, threaded discussion, chat or instant messaging all embedded within the course).		✓	
12. DL product.	✓	✓	✓
13. Phase learning product.	✓		
14. Quota-managed training.	✓		✓
15. Army Training Requirements and Resource System (ATRRS)-managed, automated communication for tracking of assignment, registration, or completion.	✓		✓
16. ATRRS-managed, facilitated communication for manual assignment, registration, or completion.		✓	
17. Separation of content by center, school, or proponent allowing for branding of platform for individual proponents.		✓	✓
18. Courses that do not require blended learning or facilitation.	✓		
19. Courses that do not require synchronous learning.	✓		
20. Courses that do not contain video or contain only small videos (no larger than 20 megabyte (MB)).	✓		

Chapter 8
Evaluation

8-1. Courseware validation
Validation is the quality control process that determines if learning products and components perform as intended, the course/courseware complies with all applicable policy and guidance, and that personnel receiving the instruction can perform the objective to standard. All DL courses and courseware must be validated. This includes assessment validation, content validation, and educational validation.

8-2. End-of-course survey
Surveying students provides critical information on the success of DL, course design, interactivity choices, technical issues, etc. Surveys may be given directly to students or sent to the students' next assignment to measure unit satisfaction with the training. A sample survey is provided in appendix H.

8-3. Test security
Establish standard DL test security preventive measures that will impede, obstruct, and restrict a student's access to DL test answers. The process will reduce compromise of DL tests and test items, and maintain the integrity of the test. Implementation of effective DL test preventive measures reduces the probability of compromise of DL tests. The recommendation of standardized security features would enhance DL test security.

    a. Establish a time limit per DL test (the system stops grading the test and results are not posted).

    b. Establish a test retake policy. Set a limit on how many attempts a Soldier is able to retake a test. Once the Soldier exceeds the maximum attempts, a letter is sent to the Soldier's company commander. The LMS automatically releases a letter only after the Soldier exceeds the limit(ex: adapter release/perimeters within the LMS).

    c. Show only one question on the screen at a time (this process deliberately slows the capture of test content using a digital phone or camera).

    d. Randomize questions and distractors each time a student accesses a DL test (an option to prevent users from seeing the test questions in the same order).

    e. Increase the size of the test-question pool. Lifelong Learning Capability provides two methods to accomplish this: random block tests and question sets.

    f. Prohibit printing, copying, and pasting questions on DL into other documents (accomplish through the LMSs, not individual systems).

8-4. Target areas for evaluation and assessment
To ensure that the evaluation and assessments are on target, course managers should ask themselves:"

    a. Are we focusing energy and resources on the right initiatives? Are we doing too much or not enough?

    b. Are we creating or buying effective designs?

    c. Do we have the right balance between design and implementation?

    d. Are commanders eager for Soldiers to use DL training, and are Soldiers anxious to use it?

    e. Are Soldiers satisfied or comfortable with DL training?

f. Are Soldiers learning through the use of DL?

g. Is TCM-TADLP communicating effectively with development, training, and training management communities?

Chapter 9
Contracting for DL

9-1. Contract overview
DL developed by contracting agent is closely monitored by proponent schools. The DL contract contains specifics on the development of the courseware and on the specific technical guidelines to be followed. The CAPDL contract vehicle is a firm, fixed-price services contract and is different from previous contract vehicles used for content development and delivery. The following are important considerations for content development:

a. There is a quality assurance surveillance plan in effect to track contractor performance.

b. The Contractor may develop "parts and pieces" of training and education products that in-house developers use in building the final finished product; it is the "chunk" strategy to training development.

c. In-house development of content will be held to the same standards and specifications as contractor development of content.

d. Periods of performance dates are firm, and they cannot and will not be extended.

e. GFI and GFM must be included in the Request for Quote package. The contractors must be able to inspect the GFI as part of calculating their bids on task orders (TOs).

f. SCORM testing remains part of the TCM-TADLP acceptance process.

g. Government acceptance is by the TCM TADLP.

9-2. Performance work statement (PWS) preparation

h. The CAPDL PWS guidelines contain information and tips to aid in developing PWSs for the development of content and courseware for DL IMI and provide the capability to insert unique requirements the proponent school identifies. The PWS establishes contractor performance criteria and deliverable requirements for the development of DL courseware under the CAPDL contract vehicle. Schools use the guidelines to provide variable data that identifies the school, the applicable course, GFI/GFM, and unique design specifications, when applicable. When requested, TCM-TADLP (ATIC-IC) will assist in tailoring the PWS to meet other specific or unique development requirements, as needed. TCM-TADLP will publish and post online a guide to development of PWS.

Note: Schools keep the PWS current until award of the TO. The TCM-TADLP notifies the field of updates to the PWS guidelines; however, proponents should check the PWS Web site for any changes.

   i. Schools/proponents will identify staff assignment of supporting roles and responsibilities. These roles include identifying who is responsible for providing and assembling GFI/GFM and who will fill the role of SME to respond to contractor questions, reviews of contractor deliverables, and consolidation of comments sent back to the contractor. Additionally, the use of internal memoranda of agreement among key personnel will be used to establish priorities within these roles.

      (1) COR responsibilities for the TCM-TADLP and all Army requiring activities (RAs) that wish to utilize the Combined Arms Products for Distributed Learning Contract will ensure the effective oversight of contract requirements when contract support cannot be directly monitored by a TCM-TADLP/CAPDL Contracting Officer Representative located at Fort Eustis, VA.

      (2) Roles and Responsibilities

      a. All RAs will include an Alternate COR (ACOR) nomination with their requirements package submission (if onsite presence in required), to fulfill the ACOR responsibilities. Specific ACOR information, as it applies to CAPDL, can be found at http://www.atsc.army.mil/tadlp/content/nomination/before/index.asp under the title "CAPDL Contractor Officer Representative memorandum of understanding."
      b. At a minimum, all ACORs must complete the following Defense Acquisition University (DAU) on-line training (and submit completed certificates with their COR nomination):

         o   CLM 003 – Ethics training for Acquisition Technology and Logistics
         o   CLC 222 Section 888 – On-line Training for Contracting Officer Representative
         o   ACC Comprehension Training (January 2012)
         o   Wide Area Workflow (WAWF) https://wawf.eb.mil

      c. All CORs (TCM-TADLP and Alternate CORs / Supporting CORs) will complete the COR nomination process using the Virtual Contracting Enterprise (VCE) COR module found at https://arc.army.mil/COR/. ACORs will self-nominate using the category of Alternate COR. The MICC-Eustis KO will appoint all CORs using this electronic process. ALL COR VCE nominations that do not meet the minimum COR training requirements will not be approved/appointed by the MICC-Eustis KO.

9-3. Contract basics

   a. The CAPDL (base contract) provides the guidelines, tips, and other information to aid in developing PWSs for the development of content and courseware for DL IMI and provides the capability to insert unique requirements the proponent school identifies. The PWS establishes contractor performance criteria and deliverable requirements for the development of DL

courseware under the CAPDL contract vehicle. Schools use the guidelines to provide variable data that identifies the school, the applicable course, GFI/GFM, and unique design specifications, when applicable. When requested, TCM-TADLP (ATIC-IC) will assist in tailoring the PWS to meet other specific or unique development requirements, as needed.

Note: Schools keep the PWS current until award of the TO. The TCM-TADLP notifies the field of updates to the PWS guidelines; however, proponents periodically check the PWS Web site for any changes.

   b. IMDP. The IMDP provides Army reviewers with an overview of the final IMI courseware plan. It contains the design documentation for the development of instructional media materials. See appendix H (Components of the IMDP Process) for more details.

   c. As part of the DL contract, contractors are required to produce the IMDP and submit it for government review. Senior school management should review and approve the design documentation before development begins.

   d. In-house developers are not excluded from this requirement and should develop design documentation of the IMDP. Senior school management should review and approve the design documentation before development begins.

   e. If the plan changes during development, revise the IMDP and file with final courseware documentation.

   f. The following is a general outline of the IMDP process.

      (1) Review source documents and previous design decisions.

      (2) Prepare the front matter.

      (3) Prepare the summary description of the course.

      (4) Identify the sequence of objectives.

      (5) Prepare the course overview.

      (6) Prepare the DL design specifications.

      (7) Obtain school management review and approval.

9-4. The IMDP process goal
The IMDP is a demonstration of the plan to develop courseware. The goal should be a clear description of the proposed course design and delivery method. The IMDP should demonstrate an understanding of instructional design, the instructional goals of the lessons, and a plan to implement the goals with sound delivery methods. The IMDP:

   a. Provides reviewers a chance to visualize the plan before the start of development.

   b. Offers reviewers and developers a platform for discussion of the development plan.

c. Provides a way to make changes that will not affect work already completed.

9-5. Deployment guidelines

a. Browser check. Courseware functionality will verify the compatibility of the user's browser type and version. This may be an application that is available before the student launches the courseware or available through the "help" feature of the courseware. If the browser type and version currently used do not meet these requirements, display a warning message to the user. Additionally, if for any reason the browser type and version are not adequate to display any content that the developer has included in the courseware, display a similar warning message. The warning message will state the reason that the current configuration is not adequate, and will advise the user to install the appropriate version of the browser. If the browser being used is adequate to run the courseware, no message will be displayed.

b. Plug-ins check. The developer will include the necessary programming to check for the presence of any plug-ins required by the course. This may be an application that is available before the student launches the courseware or available through the "help" feature of the courseware. The check must be done prior to any attempt to load the plug-in when the courseware first opens or at the point that a plug-in becomes necessary. Each courseware that uses a plug-in will do this check again, even though it may have already been done by a previous courseware of the course. If a required plug-in is determined to be missing, display a message informing the user of this fact and explain how to obtain the plug-in. Content that will not be distributed Army-wide may have special browser and plug-in requirements that must be identified early.

c. CD-ROM production and development considerations. Delivery of courseware by CD-ROM is still part of the reality of military DL. The considerations that appendix K describes are based on are issues and problems that have occurred during the development of several multimedia courses. These considerations are listed in three categories to reflect the three different modes of development: general, Web version equivalent, and CD-ROM only. Apply the appropriate guidelines to any IMI development placed on CD-ROM.

d. Classified material. Any file containing classified/sensitive material must be marked with appropriate classification/sensitivity markings. Videos shall include the security level classification or warning notices IAW AR 380-5. The classification shall remain displayed long enough to be readable but does not have to remain on the screen throughout the entire video. A DD Form 254 must be in place to produce classified material.

e. Copyright/proprietary materials. Developers must comply with copyright and intellectual property laws. Anything incorporated into the learning product (text, images, music, audio, or video, etc.) developed by others requires permission for use according to Library of Congress Circular 92, Copyright Law of the United States of America and related Laws contained in Title 17 of the United States Code (17USC). For additional information and clarity refer to http://www.atsc.army.mil/tadlp/contractors/capdl/compliance/copyright.asp.

9-6. DL contractor development process

a. The process for developing courseware under the CAPDL contract is adaptable for proponent school in-house developers and contractors to use outside of the contract vehicle. This process promotes standardization among all DL developers and ensures all Army DL products are compatible with ALCMC software and hardware. The process consists of a series of activities grouped into four phases: pre-award, development, fielding, and sustainment. These phases are described below and addressed in the following chapters. The tasks and procedures TCM-TADLP uses to oversee and support the development process are in appendix B.

b. The pre-award phase precedes the awarding of a task order (TO) for DL course or courseware development. During the pre-award phase, proponent schools, TCM-TADLP, ATSC, and CAC perform administrative and coordinating activities to ensure that funds are available, a viable development strategy exists, and if required, the DL instructional unit is entered in ATRRS. Pre-nomination activities include delivering and approving an updated ITP and CAD or program of instruction, providing required supplemental information, developing a course-specific PWS/SOW, and assembling required GFI/GFM. Based on the accomplishment of pre-award activities and TCM-TADLP's review of GFI/GFM and other pertinent information (for example, CAD and ITP), the ATSC advises the Headquarters TRADOC G-3/5/7 on the readiness of the school to proceed to contract award.   After the award of a TO to a learning product development contractor, a post-award meeting between the contractor and the Government kicks off the development project. Government representatives normally include the contracting officer representative (COR), a TCM-TADLP courseware manager, the technical representative, and school personnel. Other TCM-TADLP personnel may attend to assist the contractor in understanding development standards and requirements. The primary goals of the meeting are to ensure complete, mutual understanding of the project and to establish a cooperative relationship between the contractor and school personnel. All parties approach the project as a team effort.

c. Successful completion of the development effort requires complete understanding of the PWS requirements. The purpose of the meeting is not to rewrite the PWS, but to execute the PWS as written.

d. The contractor records and submits the minutes of the meeting to all attendees for comment. After receiving comments, the contractor prepares and distributes final minutes to all attendees.

e. Provide GFI and GFM.

(1) Provide GFI and GFM at the time of course nomination. Complete and relevant GFI and GFM are crucial to the development of high quality courseware. Failure to provide correct or sufficient materials can seriously impede the development effort, or halt it entirely.

(2) The Government furnishes information and/or materials to the contractor to enable the contractor to design a courseware development strategy and perform the contractual services. GFI and GFM may include documents, equipment, software, facilities, and services.

(3) Assemble GFI/GFM packages.

(4) The development team performs the following action in assembling GFI/GFM packages to deliver to contractors: provide complete and relevant information to ensure development of high quality courseware.

(5) The development team follows the steps below:

(a) Upon notification that a particular course is selected for development, identify appropriate source materials

(b) Retrieve source materials and determine their relevancy to the development effort

(c) Remove irrelevant materials and assemble remaining materials into packages for delivery to the contractor

(d) Deliver GFI/GFM packages to the contractor at the post-award meeting.

f. The development phase of the process begins following the award of the TO to a contractor. This phase requires continuous communication and cooperation between the Government (the proponent school and TCM-TADLP) and the contractor. The objective is the contractor's complete understanding of the Government's requirements and expectations concerning the DL products. This is best accomplished with close coordination during a series of meetings, in person, teleconference or video conference methods.

g. The contractor prepares and submits to the Government for approval a milestone schedule, a validation plan, an assessment and evaluation plan, an ISAP, an instructional multimedia design package (IMDP), and a prototype lesson (if required by TO) demonstrating understanding of the instructional and technical requirements. Once these deliverables are approved and the technical approach agreed upon, the contractor proceeds to develop the courseware. The contractor delivers lessons to the Government as they are completed. The lessons receive quality assurance, technical reviews, and corrections as required. After passing these reviews, the DL course is validated for instructional sufficiency and tested in a common test environment to ensure courseware compatibility with ALCMC equipment. The fielding phase may include operational tryouts during the first iteration of implementation. Upon satisfactory completion of all reviews and tests, the Government accepts and prepares the courseware for release to the field.

h. The fielding phase involves entering the completed DL product into the ALCMC and ATRRS (if required), and completing the catalog information to register the course/module with the CAR. Schools submit the uniform resource locator address for Web-based courses. The CAR uses the uniform resource locator to point to the location where the courseware resides.

i. The sustainment phase follows the ADDIE process. The proponent schools review and update learning materials periodically IAW their training development plan, or whenever a significant change to doctrine, procedures, or equipment occurs, to ensure materials remain up-to-date and relevant to Army missions, functions, and skills. Proponent schools identify

requirements to revise courseware as soon as possible. They include these requirements in their planning, programming, budgeting, and execution process.

j. Periodic content review of learning products cataloged on the CAR requires proponents to conduct periodic course reviews and revise courses annually as required. Learning product revisions are immediately mandatory when task performance threatens survivability, mission accomplishment, or when a major environmental or safety impact is identified. Perform QC checks. This package includes QC checks for the courseware development and implementation in the form of performance measures. Meeting these checks assures all levels of management of the successful implementation of DL products.

9-7. Period of performance

a. Calculating DL development time period. In planning IMI, it is useful to consider the amount of time required to develop the project. This provides a basis for evaluating a cost-to-benefit decision. Assumptions can be made for estimating development hours. There are factors and variables that can affect the development time required to develop 1 hour of completed IMI. The following list of factors defines a best-case situation:

(1) The developer is familiar with the subject matter and has access to in-house SMEs.

(2) The subject matter is not highly complex.

(3) The instructional content is stable. In other words, the system for which the IMI is being developed exists and is not emerging, and the tasks selected for IMI DL do not continually change.

(4) The instructional content is well documented. A needs analysis and task analysis are complete, giving the developer a good idea of the performance expected and tasks to teach. The technical materials supporting the IMI development are accurate and available.

(5) The developer is familiar with the selected IMI authoring system.

(6) The developer is familiar with the target audience.

(7) The development team consists of individuals experienced with IMI management, design, and development.

(8) The selected IMI authoring system is mature and stable. No beta versions are used.

(9) A lesson format, to include the design strategy, is agreed upon in advance and management has approved the strategy, prototype lesson, and lesson specifications.

(10) The development process is standardized.

(11) An instructional strategy is approved and a wireframe is tested.

(12) The COR and SME work closely with the development team on a regular basis. The COR uses objective acceptance criteria and does not continually change the individual responsible for reviewing and approving the lessons.

(13) Best commercial practices are accepted for software development and video production. There is no requirement to document to a military standard.

(14) All required resources are in place.

   b. Calculating time in government acceptance testing. TCM-TADLP performs the function of government acceptance testing using the following process:

(1) Contractors shall load the content following the final course structure provided by the proponent.

(2) The contractor shall perform playability testing for all instructional strategies and exercising all exit paths.

(3) Contractors shall document the results of all instructional strategies to include roll-up and completion status.

(4) Contractors shall submit the results of their tests to TCM-TADLP who will document and notify all stakeholders. After confirming receipt of all deliverables and screen shots displaying test results, notify the PD-DLS that the courseware is ready for operational testing in the common test environment.

(5) PD-DLS will acknowledge the courseware is ready for testing and the date courseware entered into their testing pipeline.

(6) PD-DLS will provide all stakeholders with a daily report that reflects the status of the proponents' products as they move through the pipeline. This report will include, at a minimum: the date received in testing, tester assigned, iteration of test, product being tested, contractor name, results with dates, notifications, and fielding date.

(7) Any product with critical errors that fails to perform correctly during the testing process will be removed from the pipeline with notification to the stakeholders. Once notified, the contractor will work with the proponent and PD-DLS to correct the errors and resubmit to PD-DLS. The contractor will notify all stakeholders of the resubmission.

(8) Any product with non-critical observations will be fielded with notification to the stakeholders of the date of fielding. Once notified, the contractor will work with the proponent to correct the errors and resubmit to PD-DLS. The contractor will notify all stakeholders of the resubmission.

(9) Once the courseware is fielded and error free, TCM-TADLP (ATIC-IC) will complete government acceptance, notify the COR, and ensure final payment to the contractor is made.

(10) After government acceptance is made, the contractor will deliver a copy of the final courseware/content products for archival purposes.

9-8. In-house development

a. Authoring systems/tools overview. Authoring systems/tools provide easy-to-use interfaces that can decrease many of the technical issues associated with SCORM development. Most developers use database-driven authoring tools that speed up the development process. The systems/tools also provide courseware with a consistent appearance. Whether choosing an off-the-shelf authoring system/tool or using a proprietary system, a number of factors should be considered: the learning product requirements, standards, and specifications; cost and time constraints; standard features; ease of use; and ability to be modified. Table 9-1 lists the most common advantages and disadvantages of authoring systems.

Table 9-1
Authoring system advantages and disadvantages

Advantages	Disadvantages
b. Brisk development.	g. Increased initial/upgrade costs.
c. Professional quality through the use of templates and/or tools.	h. Possible cross-platform compatibility issues.
d. Consistent look and feel of courseware.	i. Possible problems with generating metadata and manifests.
e. Reduced need for programmer.	
f. More reliable (fewer defects).	j. Limited capabilities without programming support.

b. Rapid Online Content Creation Environment (ROCCE). ROCCE is a Web-based content development tool used to build interactive courses that can be published on the Learning Content Management and Creation System. It enables online collaborative content development and produces SCORM compliant courses on the Learning Content Management and Creation System. ROCCE2 supports multi-role content development functions and complies with Department of Defense instruction (DoDI) 1322.26 standards. It is a government off-the-shelf product.

c. Productivity tools. Productivity tools range from small software applications used for very specific jobs to all-encompassing authoring systems with formatted templates, automated SCORM calls, and metadata generators. Many developers use tools that catalog files, review products, and analyze validation data. These tools offer efficiency and, if contracting, a competitive advantage to the contractor. Tools provided by ADL and the Army give developers an easy to use interface to implement proper SCORM testing. Examples of "acceptable tools" or tools that produce results compatible with the current recognized LMS systems (Lifelong Learning Capability and ALMS). These tools reduce government cost and provide standardized

methods of developing and testing. This, in turn, makes development and testing faster and easier. However, these tools do not provide a 100-percent solution.

(1) ADL test suite software. This software contains conformance testing software, procedures, and supporting documents to perform self-testing on LMSs, SCOs, metadata, extensible markup language (XML) documents, and content packages.

(2) Multilog parser. This simplifies the review of the contractor/developer-submitted logs by summarizing their information.

(3) Resource validator. This compares physical files to the resource files reference in the manifest to determine whether the manifest is complete. It also verifies the existence of all external links in the manifest.

(4) Manifest auditors. This verifies that all file paths contained in the manifest are valid paths to existing files.

(5) XML core services. This provides XML parsing routines for the resource validator.

(6) Sequencing templates. Sequencing templates are examples of a particular sequencing strategy that can be used for a particular part of a course. Developers can take all or parts of sequencing templates and/or combine features from several different templates for the development of a wireframe for a content package. Sequencing templates will have generic names for SCOs, such as "SCO-1." Sequencing templates should be generic content packages, not tied to any actual content.

(7) Cascading style sheets (CSS). CSS separate the presentation style of Web pages from content and standardize the appearance of courseware from SCO to SCO. Using CSS simplifies Web authoring and site maintenance. To maintain a consistent look, use a single external CSS within each SCO that contains the majority of style information for that SCO. Then copy the external style sheet from one SCO into the next SCO to maintain a consistent style from SCO to SCO. If there are special circumstances that require a different appearance for a page or section within the SCO, the styles can be overridden with the use of inline styles or embedded style sheets. Use CSS calls that are part of the existing World Wide Web Consortium (W3C) standards (1, 2, and 3) and function in the browser specified in the delivery or task order.

Note: No browser fully supports all of the standards. Do not use tags that are not supported by the W3C standards and do not use a browser's specific tags.

d. SCORM conformance and waivers

(1) Degree of conformance. SCORM conformance is a requirement for all Army DL browser-based courseware that requires tracking by an LMS. All courseware developed to SCORM specifications and standards must be tested for SCORM conformance IAW U.S. Army acceptance criteria.

(2) Waivers. Although SCORM's increased capabilities have reduced the need for waivers, a learning strategy not supported by SCORM may still necessitate a waiver. Developers may send an e-mail request for waiver to TCM-TADLP. Any part of the courseware that is not covered by a CAC-approved waiver must be SCORM conformant. DoDI 1322.26 includes a number of capability exemptions. However, this does not mean that the Army makes these exceptions. Waivers may be granted for the following:

(a) Security reasons.

(b) Using complex logic requiring server-side scripting and/or dynamic databases used at run-time.

(c) Using a third party interface.

(d) Using new technologies and/or experimental approaches that prevent the courseware from being SCORM conformant.

(e) There will be no reporting of test scores to ATRRS.

(f) Content is very perishable and will be replaced or updated frequently.

Note: Selection of instructional approach may mean courseware cannot be SCORM conformant because it is needed immediately (for example, courseware on improvised explosive devices, just in time training, training on demand, safety or mission critical courseware), and/or because it is not developed at the CAC-mandated ELO SCO level (for example, a simulation that covers more than a single ELO). This instructional decision must be documented with a request for waiver. The waiver should include a statement regarding future plans to bring the courseware into conformance.

Appendix A
References
ARs, DA pamphlets, field manuals and DA forms are available at www.apd.army.mil.
TRADOC publications and forms are available at http://www.tradoc.army.mil/publications.htm.

Section I
Required publications

AR 350-1
Army Training and Leader Development (Cited in paras 2-9 g. and 2-10 g.)

DoDI 1322.26
Development, Management, and Delivery of Distributed Learning
(Available at http://www.dtic.mil/whs/directives/corres/pdf/132226p.pdf.) (Cited in paras 11-1
b, 11-3 b, and D-4.)

TP 350-70-6
Analysis, Design, Development, Implementation, and Evaluation (ADDIE) (Cited in paras 2-
7h(2), and 2-18b(2).)

TRADOC Regulation 350-70
Army Learning Policy and Systems (Cited in paras 2-3, 2-4b, 2-14, 2-16, and 3-1g(1)

Section II
Related Publications

A related publication is a source of additional information. The user does not have to read a
related reference to understand this publication.

29 USC 794d
Section 508 of the Rehabilitation Act as amended by Rehabilitation Act Amendments of 1998
(Available at http://www.section508.gov/.)

Act of 13 July 2000, Public Law 106-246, Volume 114, U.S. Statute at Large
Fiscal year 2001 Appropriation for Military Construction

AR 25-1
Army Knowledge Management and Information Technology

Army Learning Object
(Available at http://www.atsc.army.mil/atimp/specifications/alo/lom_spec.doc.)

Army Distributed Learning Program (TADLP) Campaign Plan
(Available at
http://www.atsc.army.mil/tadlp/Documents/TADLP%20Campaign%20Plan%20October%20200
8.pdf.)

Army Training Information Architecture
(Available at http://www.adtdl.army.mil.)

Business Rules, Best Practices, and Examples for Army SCORM 2004 Compliant Courseware
(Available at http://www.atsc.army.mil/itsd/imi/bus_rules.asp.)

Central Army Repository
(Available at https://atiam.train.army.mil/catalog/DA Pam 25-91
Visual Information Procedures

DI-SESS-81520B
Instructional Media Design Package
(Available at https://assist.daps.dla.mil/quicksearch/basic_profile.cfm?ident_number=205358.)

DoD 5220.22-M
National Industrial Security Program Operating Manual (NISPOM)
(Available at http://www.dtic.mil/whs/directives/corres/pdf/522022m.pdf)

DoDI 5040.2
Visual Information
(Available at http://www.dtic.mil/whs/directives/corres/pdf/504002p.pdf.)

DoDI 5040.07
Visual Information Production Procedures
(Available at http://www.dtic.mil/whs/directives/corres/pdf/504007p.pdf.)

Library of Congress Circular 92
Copyright Law of the United States and Related Laws Contained in Title 17 of the United States
Code (Available at http://www.copyright.gov/title17/index.html.)

Military Handbook (MIL-HDBK) 29612-4A
Glossary for Training

MIL-PRF-29612B
Training Data Products
(Available at https://assist.daps.dla.mil/quicksearch/basic_profile.cfm?ident_number=122906.)

SCORM
(Available at
http://www.atsc.army.mil/tadlp/contractors/capdl/compliance/scorm_business_rules.asp)

TP 350-70-1
Training Development to Support the Operational Domain

TP 350-70-3
Staff and Faculty Development

TP 350-70-7
Army Education and the Accountable Instructional System (AIS) Process

TP 350-70-9
Budgeting and Resourcing

TP 350-70-13
System Training Integration

TP 350-70-15
Army Learning Policy and Systems: Glossary of Terms

TP 350-70-16
Army Training and Education Proponents

TP 525-8-2
The U.S. Army Learning Concept for 2015

TRADOC Supplement 1 to AR 380-5
Department of the Army Information Security Program

Army Acceptance Criteria
(Available at http://www.atsc.army.mil/itsd/imi/Accept_Criteria.asp.)

U.S. Navy Style Guides & Content Presentation
(Available at https://ile-help.nko.navy.mil/ile/content/policy/styleGuides.aspx.)

U.S. Navy Submarine On Board Training Developer's Guide
(Available at https://www.netc.navy.mil/sobt/web/developers/devmain.htm.)

World Wide Web Consortium. 2006
http://www.w3.org/.

Section III
Prescribed Forms

This section contains no entries.

Section IV
Referenced Forms

DA Form 1045
Army Ideas for Excellence Program Proposal

DA Form 1059
Service School Academic Evaluation Report

DA Form 2028
Recommended Changes to Publications and Blank Forms

DA Form 3953
Purchase Request and Commitment

Department of Defense (DD) Form 2568
Defense Instructional Technology Information System (DITIS) Report

U.S. Government Printing Office Form 952
Desktop Publishing — Disk Information

Appendix B
TADLP Course Development Oversight Tasks
Figure B-1 lists TADLP course development oversight tasks.

	Task/action
1.	*Pre-award phase*.
2.	Receive CAC Priority List.
3.	Contact proponent and determine in-house or contract development.
4.	Receive waiver request.
5.	Provide waiver or exception recommendation.
6.	Receive waiver decision from TCM-TADLP.
7.	Confirm completeness of The Army Training System course development package.
8.	Determine availability of course and DL task analysis.
9.	Receive CAD and supplemental information from proponent school/ Training Operations Management Activity.
10.	Confirm course in ATRRS.
11.	Confirm availability of task data in CAC-approved automated development system.
12.	Confirm school conducted DoD imagery search and submitted DD Form 2568 (Defense Instructional Technology Information System (DITIS) Report).
13.	Confirm availability of GFI/GFM.
14.	Verify school is using correct version of SOW template.
15.	Make decision to proceed.
16.	Assist school with SOW development.
17.	Receive SOW from school.
18.	Review SOW.
19.	Prepare independent government estimate.
20.	Develop Acquisition Requirements Package.

	Task/action
21.	Request DA Form 3953 (Purchase Request and Commitment).
22.	Staff Acquisition Requirements Package with the TCM-TADLP (ATIC-IM).
24.	Receive contractor proposal.
25.	Analyze proposal(s).
26.	Receive TADLP funding.
27.	Make delivery order (DO) decision.
28.	*Development phase*.
29.	Award DO.
30.	Post-award meeting.
31.	Notify participants.
32.	Conduct post-award meeting.
33.	Receive milestone schedule.
34.	Confirm validation plan and dates are established.
35.	In-process review (IPR).
36.	Notify course manager of scheduled IPR.
37.	Attend IPR.
38.	Receive IMDP/prototype lesson.
39.	Staff IMDP/prototype lesson for review.
40.	Determine IMDP/prototype lesson educational compliance with regulations.
41.	Determine IMDP/prototype lesson technical compliance.
42.	Consolidate review comments.
43.	Provide review comments to proponent.
45.	Assign LMS course/module/assessment number.
46.	Modify DO.
47.	Receive modification proposal from contractor.
48.	Make DO modification decision.
49.	Lesson deliverables.
50.	Receive lesson deliverables.
51.	Staff lesson deliverables for review.
52.	Determine technical compliance.
53.	Determine contractual compliance.
54.	Determine educational compliance.

	Task/action
55.	Provide comments to proponent.
56.	Receive and upload courseware files via FTP for school developmental testing.
57.	Receive and review learning product evaluation document.
58.	Confirm course validation date.
59.	Conduct final review.
60.	Receive and conduct final review of completed courseware at TCM-TADLP.
61.	Receive proponent validation statement.
62.	Receive Judge Advocate General release, safety statement, card catalog form, and DTF testing certification.
63.	Receive course basis of issue plan, DAVIS/DITIS form from school.
64.	Staff completed courseware with IMI support for technical review.
65.	Conduct final technical compliance and DTF review.
66.	Conduct final education compliance review.
67.	Forward exam, answer key, DAVIS/DITIS number to Courseware Management.
68.	Verify completeness of exam material and forward exam with assigned course/module/exam number to Distance Learning Support Service Team
69.	Set up courseware in TRADOC Educational Data System Redesign.
70.	Repair courseware.
71.	Determine extent of repair.
72.	Determine who will fix.
73.	Repair courseware.
74.	Create or receive new master copy.
75.	Staff with TADLP for DTF testing.
76.	Staff product for CAR and LMS compliance review.
77.	Conduct CAR compliance review.
78.	Conduct LMS compliance review.
79.	Accept the product.
80.	Verify LMS link (select codes in ATRRS and year available) for student distribution.
81.	*Fielding phase.*
82.	Complete administrative header page for CAR.
83.	Provide courseware to the TCM-ATIS for CAR.
84.	Load or linked through the CAR.
85.	Replication and distribution.

	Task/action
86.	Provide courseware to the Training Media Support Team (TADLP).
87.	Accept product for replication.
88.	Determine publication requirements.
89.	Submit replication request.
90.	Replicate courseware.
91.	Courseware available for implementation/notify course manager.
92.	Course manager notify Distance Learning Support Service Team that course is available for fielding.
93.	Activate courseware in LMS.

Figure B-1. TADLP course development oversight tasks

Appendix C
Minimum Essential Requirements
This appendix lists minimum essential requirements for DL products.

C-1. Course/lesson structure
Table C-1 lists the minimum essential requirements for DL course/lesson structure.

Table C-1
Minimum essential requirements for DL course/lesson structure

Requirement	Description
1. Intuitive design	a. The student should understand what to do to advance through the instruction. b. Navigation aids, tutorials, and design of interface elements should inform the student what to do for the different types of presentations in the instruction.
2. Logical arrangement of content	a. Information is clustered and chunked to flow in an orderly and logical flow. b. The structure of the presentation is clear to the student and is consistent throughout the module or course.
3. Clear indication of prerequisites	If the instruction requires mastery of previous LSA or a certain level of knowledge is assumed for the instruction, let the student know up front what they are. This enables the student to review or learn the prerequisite material prior to starting instruction requiring that skills and knowledge.

Table C-1
Minimum essential requirements for DL course/lesson structure

Requirement	Description
4. Clear indication of LSAs	a. A clear, consistent method of indicating LSAs, modules, or lessons in the course. This may be presented as a course map, table of contents, menu of pages, so that students can see what lessons are in the course and where they are relative to the next step. b. A progress bar or other visual is helpful to show the student what they have completed.
5. Sources of additional information	If additional sources of information are known, the student should have access to that information. This offers the student who has successfully completed the material a path to additional material on the subject to assist in professional development.
6. Typical IMI lesson structure	a. Course map or table of contents. b. Lesson objectives. c. Assessment.
7. On each page/screen of information	a. Tutorial access. b. Lesson title. c. Notes access. d. Progress bar or time left in lesson.
8. Help	a. Tutorial. b. Context-sensitive. c. Limited to navigation.
9. Standard metaphors	a. Note-taking during instruction. b. "Conversation" with/through avatar.
10. Bookmark	a. Page/screen. b. LSA.
11. Navigation controls	a. Do not interfere with instruction. b. Is located easily. c. Provides access to course map, table of contents, or menu. d. Allows for easy navigation throughout the courseware. e. Links to pre-assessments and post-assessments, a help menu, individual lessons, and sub-step or activity. f. May include LSAs within a lesson but these can be submenus. g. Has exit option available for each page. h. Shows students where they are in the instruction.

C-2. Introduction of instructional unit
Table C-2 lists the minimum essential requirements for introduction of instructional unit.

Table C-2
Minimum essential requirements for introduction of instructional unit

Requirement	Description
1. Instructional unit	a. Purpose/scope. Describe the course/phase/module/lesson, as appropriate.
	b. Target audience description. Identify who must take the course/phase/module/lesson.
	c. Prerequisite instruction requirements. Provide only if there are any prerequisite instruction requirements.
	d. ISAP introduction. Refer the student to and provide link to the ISAP.
	e. Course/phase/module/lesson map. Provide visual roadmap of how the lesson and the LSAs fit in the course. Students must be able to access at any time in the courseware.
	f. Time requirements. Identify the average and maximum time allowed to complete the course/phase/module/lesson, as appropriate.
	g. Honor code. Add the following statement, "By executing this courseware, you are agreeing to abide by the assessment standards established in the courseware. You are expected to do your own work on all learning exercises and all assessments ."
2. Help and navigation features	a. Help overview. Introduce the help function and the basic navigation tools. Indicate that more detailed follow-on information can be accessed at any point in the program.
	b. Indicate how to use the bookmarking capability. Include:
	(1) Help function and its contents.
	(2) Navigation tools and buttons.
	(3) Information on how to access additional help.
	(4) Bookmark feature.

Table C-2
Minimum essential requirements for introduction of instructional unit, continued

Requirement	Description
3. Resources	a. List required resources reflecting current and emerging doctrine or make available prior to beginning the instruction. b. Identify all additional resources needed to complete the training. If references are included/ linked, provide guidance on accessing them. c. Link to references (manuals, instructions, regulations, pamphlets, circulars) are clearly visible. d. Original source material is linked to so the student can refer to it as needed for clarification or interpretation of the material presented in the instruction.
4. Multi-modal instruction	Instruction should use multiple modes for teaching mastery of the material. Text, audio, video, animation, and simulation should all be considered for use in presenting instruction.
5. Varied methods of presentation	Higher-order skills should be taught using multiple presentation techniques. Simulation or the use of avatars may help the student internalize the skills and knowledge and enhance the student's ability to perform the task.
6. Consistent metaphor	If a metaphor is used for presenting the instruction, the same metaphor or closely related metaphors should be used throughout. Awareness of cultural issues should be used to select a metaphor that applies to most students.
7. Motivator	a. Provide relevance and significance to the courseware. b. Gain the students' interest and focuses them on what they are about to learn. c. Explain why the student needs to perform the learning objective and what the consequence of nonperformance is. d. Explain the actual job or battlefield conditions that would make learning the objectives essential for the student.

Table C-2
Minimum essential requirements for introduction of instructional unit, continued

Requirement	Description
8. TLO	a. State the action the student must perform at the end of the lesson. b. State the conditions of the performance. c. State the standard that the student must meet to obtain credit for completing the lesson.
9. Safety, cautions, notes, and warnings	a. List the requirements at the beginning of each lesson. b. Include safety notes, warnings, and cautions as appropriate throughout the lesson.
10. Risk assessment code	Code may be required if the lesson requires use of additional equipment beyond the computer. a. State the risk level of equipment operation or procedures included in the lesson content, and measures to take to reduce that level. b. List the risks at the beginning of the lesson and the controls to take to lessen the level of risk.
11. Environmental statement, as required	a. Statement may be required if courseware requires use of additional equipment beyond the computer. List the requirements to lessen the impact on the environment. b. Actions that reduce environmental impacts are identified in lesson content, as applicable.
12. ISAP	a. Include information regarding assessment of performance of TLO. b. Include statement regarding timing of assessment and remediation policy. c. Inform students how they will be assessed on the TLO. d. Indicate if students will be evaluated as part of this or another lesson. e. Identify assessment re-take policy.
13. Instructional lead-in	If possible, link the TLO to previous instruction to establish transfer.

C-3. LSAs
Table C-3 lists the minimum essential requirements for LSAs.

Table C-3
Minimum essential requirements for LSAs

Requirement	Description
1. Instructional objective defines the sequence	The flow of the lesson material is consistent and structured consistently throughout the course. There are no curves thrown to the student by a lesson or module that deviates from the course norm unless absolutely necessary for the instructional goal to be met.
2. Accommodate different learning styles	a. The instruction is structured and presented using different learning styles to facilitate mastery of the material. b. Promote active learning (frequent student involvement). c. Use multiple learning resources (print, audio, video, Internet, CD-ROM, etc.) that reinforce the instruction and keep the student engaged.
3. Frequent feedback	The students should have a good idea if they are "on the right track" with the learning. Periodic breaks in the instruction to ascertain whether the student has a grasp of the material and can apply the knowledge should be included. If a student is unsure, there should be a mechanism to give a hint or ask for help using either synchronous or asynchronous communication methods.
4. Clearly defined educational philosophy	The instructional design should present a clearly defined set of goals and requirements for both the student expectations and the instructional materials.

Table C-3
Minimum essential requirements for LSAs

Requirement	Description
5. Clearly stated and appropriate, effective learning strategies	a. Select learning strategies appropriate to the type of instruction and level of student knowledge. b. Instruction "chunked" into meaningful units. Instruction should be broken down into small, "bite-sized" chunks that a student can easily master before moving on to other chunks. c. A SCO should be no more than 50 minutes. It should contain internal logic to provide the student logical breakpoints to change the pace at approximately 15 to 20 minute intervals. Design for some student involvement/student activity at least every eight minutes.
6. Clear indication of prerequisites	If the instruction requires mastery of a previous LSA or a certain level of knowledge is assumed for the instruction, let the student know up front what they are. This enables the student to review or learn the prerequisite material prior to starting instruction requiring that skills and knowledge.
7. Clear indication of completed LSAs	A clear, consistent method of indicating LSAs, modules, or lessons in the course map so that students can see what they have completed.
8. Sources of additional information	If additional sources of information are known, the student should have a pointer to that information. This enables students who may have passed the material but who feel they need a little more to fully master the material to do so.

C-4. Instructional activities within a lesson
Table C-4 lists the minimum essential requirements for instructional activities within a lesson.

Table C-4
Minimum essential requirements for instructional activities within a lesson

Requirement	Description
1. Pre-assessment	a. Must allow branching/testing out of all or part of the lesson based on results of the assessment. b. The student's entry point for the instruction bypasses what the student has mastered. c. Pre-assessment should be comprehensive enough to determine prior knowledge, generate course entry points and identify suggested course map tailored to the student.
2. ELOs, if used	a. State the action the student must perform at the end of the ELO. b. State the conditions of the performance. c. State the standard that the student must meet to obtain credit for completing the lesson.
3. LSAs	a. Require student to actively interact with the program. b. LSAs must meet all requirements of course/lesson design.
4. Checks-on-learning	a. Query student to determine understanding of content. b. Provide informal feedback to the students on their progress. c. Provide the student positive feedback. d. Provide branch/loop back to materials needing review.
5. Practice	a. Provide unscored/scored practice in performing the objective or the actions required for meeting the objective. b. Include either immediate or delayed feedback based on course/lesson design.
6. Review	Cover all teaching points in the learning objective/lesson.

Table C-4
Minimum essential requirements for instructional activities within a lesson

Requirement	Description
7. Post-assessment	a. Require the student to perform the learning objective under the specified conditions to the prescribed standard. b. It must be performance or performance-based. c. It includes feedback. d. It may occur as part of this lesson or as part of another lesson. e. It validates learning with the student applying the instruction to produce measurable outcome. f. It ensures all learning objectives are measured to the same standard.
8. Remediation	a. Include only the material on which the student needs remediation. b. Present the material in different terms. Do not simply loop (branch) to the original screen covering the material. c. Include practice. d. Include feedback.
9. Multiple assessment methods	a. There should be many different types of assessment as the student progresses through the instruction. Ideally, the level of assessment should move to higher levels of Bloom's taxonomy as the student masters the material. b. Avoid reliance on one type of question or one format of assessment. Remediation should record all actions then c. Review the student actions and if incorrect, show the correct action.

C-5. Closing an instructional unit
Table C-5 lists the minimum essential requirements for closing an instructional unit.

Table C-5
Minimum essential requirements for closing an instructional unit

Requirement	Description
1. Transition	Relate this lesson to follow-on instruction, if appropriate.
2. Ending	a. Inform the students that they have completed the objective/lesson/module/phase/course. b. Identify follow-on actions, if appropriate.

C-6. Communication
Table C-6 lists the minimum essential communication requirements.

Table C-6
Minimum essential communication requirements

Requirement	Description
1. Instructional unit	a. Students know time required for module/lesson or time remaining for module/lesson if necessary and applicable. b. Tutorial is accessible and indexed for quick reference.
2. Student-instructor/facilitator communication	For courses where students have an instructor/facilitator, there should be a dialogue between the student and the instructor/facilitator (virtual or actual). The dialogue should include times that the instructor/facilitator is available and also a help desk (virtual or physical) that the student could connect to for help with instructional or technological issues. For synchronous instruction, some method of "seeing" the instructor/facilitator helps the student identify with a person rather than view the instruction as coming from a machine.
3. Student-student communication	For courses where students must interact with each other, there should be a means of easily sharing information both asynchronously and synchronously. For synchronous communication, some method of "seeing" the other students helps the student identify with a person rather than view the instruction as coming from a machine.
4. Synchronous collaboration	a. Telephone or audio conferencing. b. Video conferencing. c. Attachments for download. d. Application sharing. e. Chat. f. Instant messages. g. Collaborative map sharing/navigation/annotation. h. 3-D model sharing/navigation. i. Session recording. j. Breakout rooms/labs.

Table C-6
Minimum essential communication requirements, continued

Requirement	Description
5. Asynchronous collaboration	a. Facsimile (Fax). b. E-mail (use AKO if e-mail is requested). c. Drop boxes. d. Attachments/file sharing. e. Threaded discussions/forums. f. Collaborative writing tool. g. Chat rooms. h. Communities/groups. i. Workflow tools. j. Knowledge center. k. Document tracking. l. FTP (upload/download file transfer). *Note*: A means of transferring files between students and between students and instructors/facilitators may be necessary.
6. Army Training Help Desk (ATHD)	At a minimum, DL courseware should provide easy access to an instructor/facilitator or SME, a technical help desk, and materials that address frequently asked questions. The ATHD is in place to meet this particular requirement. However, it is critical that questions that are sent are promptly answered (within 24 hours if possible) and that support is offered on weekends when much of our Army National Guard and USAR students are taking courses. This must be from administrative, technical, and SME staff.

Appendix D
Student Control, Navigation, and Interaction

D-1. Overview
The four types of interaction are student-student, student-content, and student-instructor/facilitator, and student-interface. "Interaction" is the term used in this pamphlet to describe contact between the instructor/facilitator and the student or the student with other students. In face-to-face instruction, this is generally not part of the instructional design, but with increasing use of DL, this element must be included. Technology allows an increased opportunity to add interaction in DL.

D-2. Student-content interaction

   a. The Army has defined "levels of interactivity" to refer to the activities performed by both the student and the computer. Interactivity is seen as critical to improve student learning and efficient instruction. Research has repeatedly shown individuals learn best on their own, using well-structured, interactive courseware. Well-designed, self-paced instruction with interactivity,

has reduced training/education time, raised performance standards, reduced failure rates, and increased perceived value of the instruction.

b. In order to assist developers, interactivity has been defined in terms of levels ranging from very simple to very complex. These levels refer to the type of interaction required by the student with the LSA. While there is no consensus on the number of levels (the number of levels varies by theory and researcher), there is some agreement on their meaning. A number is assigned to each level to reflect the degree of interaction. The higher the number, the greater the level of interaction with the courseware. The DoD has defined four levels of interactivity.

c. Both government and private sector researchers have been active in defining the type of IMI appropriate for interactivity levels. Most agree with the assumption that the higher the level, the more engaged the student must be with the LSA. However, there are some caveats to interactivity. It is clear from the research and from lessons learned in earlier courseware development that interaction must be important to the instructional goals. An entertaining gaming simulation that does not lead to the instructional goal is just an expensive and potentially distracting add-in.

d. These four levels of interactivity are best understood by relating the levels to the type of interaction the student can experience within the courseware. For example, a student can move page to page through courseware by clicking on a "next" button. This type of interactivity is defined as level 1. The interaction is passive requiring little from the student but a click. It is linear in that only one direction is allowed.

(1) Passive (level 1) examples include watching a video, listening to audio, and reviewing instructional slide presentation. This level provides limited control of navigation (see figure D-1).
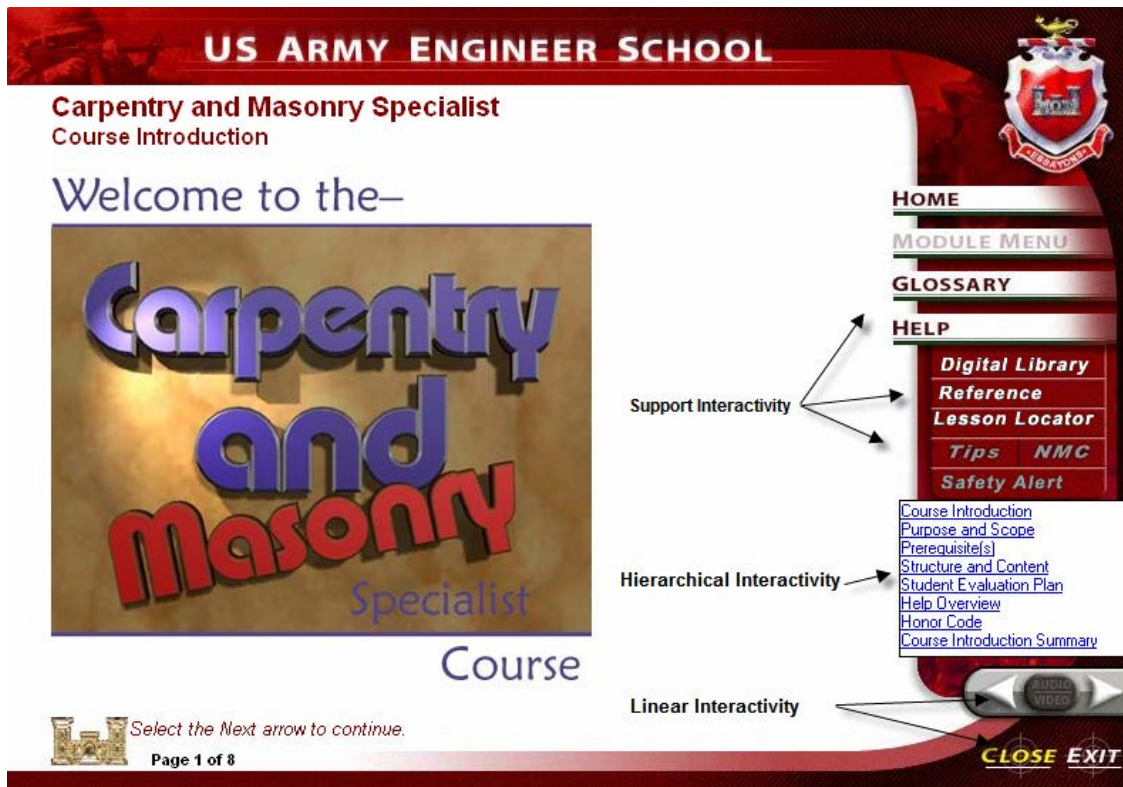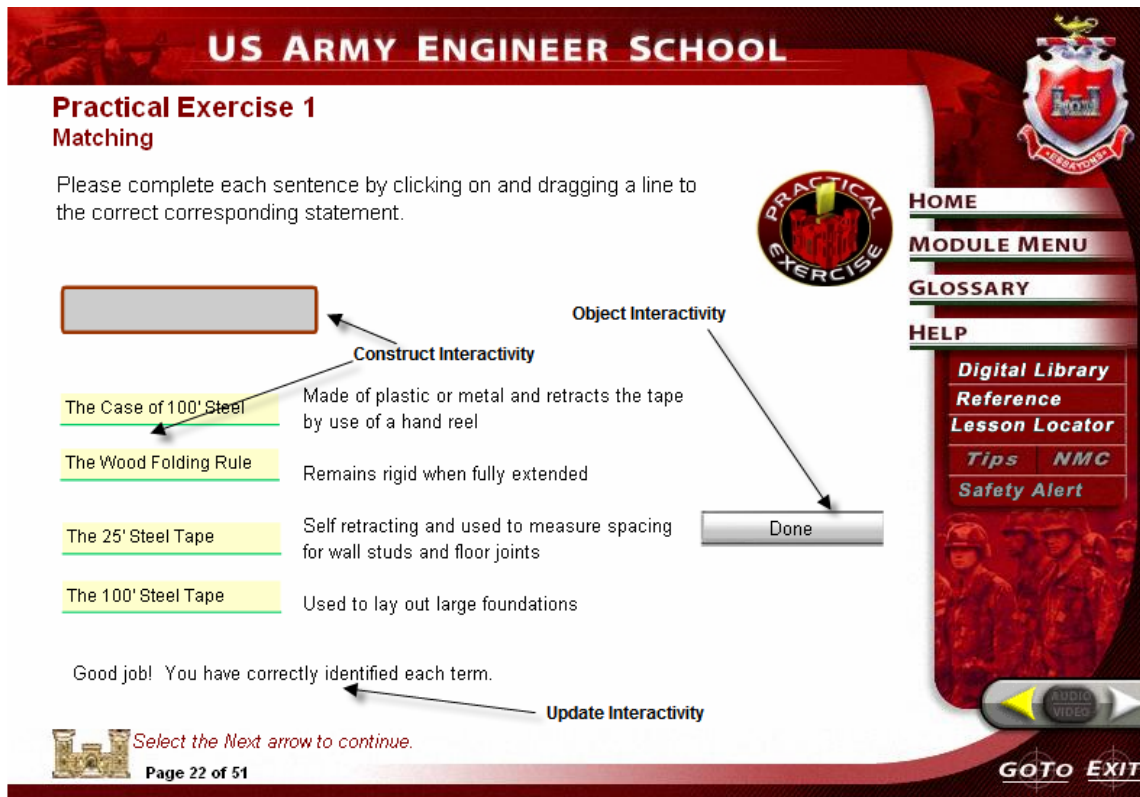
Figure D-1. Level 1 interactivity

(a) Linear interactivity (reactive pacing) refers to functionality that allows the student to move forwards or backwards through a predetermined linear sequence of the content. It is often called "electronic page-turning."

(b) Hierarchical interactivity (reactive navigation) provides the student with a predefined set of options from which the student can select a specific path or structure of accessing the content. The most common example of this interaction is the main menu where the student returns to select another option.

(c) Support interactivity (reactive inquiry) involves providing the student with a range of help options and messages, some of which can be very simple and others quite complex. The inclusion of support interactivity (reactive inquiry) in the classification extends the options of the developer to include both generalized and context-sensitive support.

(2) Simple/limited participation (level 2) is based on instructional cues. The student interacts with objects on the screen, such as point-and-click objects to open information; rollover objects (graphical images) to reveal information; and drag-and-drop objects to construct diagrams, maps, diagnostics, and puzzles. Response to student can be audio or visual. This type of interaction progresses as the student achieves performance steps offering feedback and remediation. The student has more control over navigation through the course with limited branching capability (see figure D-2).

Figure D-2. Level 2 interactivity

(a) Object interactivity (proactive inquiry) refers to an IMI program in which objects (buttons, people, things, or other metaphors) are activated by using a mouse or other pointing device. Clicking usually generates a form of audiovisual response. The functionality of such objects depends on previous objects encountered, previous encounters with the current object, or previous instructional performance.

(b) Update interactivity relates to components of the program that initiate a dialogue between the student and the computer-generated content. The program generates questions or problems to which the student must respond, either from a database or as a function of individual performance levels. The instructional rigor of the judging will determine the extent to which the update or feedback provides a meaningful response to the student.

(c) Construct interactivity is an extension of update interactivity and requires the creation of an environment in which the student is required to manipulate component objects to achieve specific goals. Unless the construction was completed in the correct sequence, the task could not be completed.

(3) Complex participation (level 3) involves simulations as a how-to guide for learning software, simulations depicting diagnostic procedures, and simulations for troubleshooting. Simulations involving decision-making allow students to make judgment calls and then follow appropriate branches for feedback and remediation. Simulations in science and environment may include chemical and biological reactions requiring the student to respond to simulated events triggered by decisions made by the student. The student controls the learning experience

by responding to instructional cues. The student is encouraged to branch, make decisions, and alter paths, and receives constructive feedback (see figure D-3).

Figure D-3. Level 3 interactivity

(a) Reflective interactivity (proactive elaboration) refers to text responses. Reflective interactivity refers to situations when a text response from the student is requested to prompts or questions from the courseware. Reflective interactivity allows the student to compare their response and make their own judgment as to its accuracy or correctness.

(b) Simulated interactivity extends the role of the student to that of a controller or operator, where individual selections determine the training sequence. The simulation and construct interactivity are closely linked and may require the student to complete a specific sequence of tasks before a suitable update can be generated. The interaction sequence can be varied according to the specific instructional strategy required or may be consequential where the actions of the student generate an update which mimics the actual operation or process being simulated.

(4) Real-time participation (level 4), gaming, high-level decision-making, and diagnosis of problems with resulting real-life consequences allow the student an opportunity to learn from mistakes. For example, students diagnose patients and prescribe treatment; hyperlinked interactivity allows the student to build a knowledge base while navigating through a wide range of information sources with access all controlled by the student. Level 4 offers discovery, reflection, exploration, judgment, and closure. Real-life scenarios with computer-generated situations include personal conflict, battlefield confrontation, interviewing and interrogation skills, and other job-related skills. The student controls the learning experience in the same way learning is experienced in real life (see figure D-4).

Figure D-4. Level 4 interactivity

(a) Hyperlinked interactivity (proactive navigation) allows the student to travel at will through a knowledge base. Linked information can provide a means to present problems which are solved by correctly navigating through the "maze" of information.

(b) Non-immersive contextual interactivity (often called immersive training for DL) combines and extends various types of interactivity into a complete virtual training environment in which the student is able to work in a meaningful, job-related context. Students are transported into a micro-world that models their existing work environment, and the tasks they undertake reflect those of the work experience.

D-3. Student-other interaction

Interaction between the instructor/facilitator and the student or the student with other students is now possible with new technology in communication and computers. In face-to-face instruction, this is generally not part of the instructional design, but with increasing use of DL, this element must not be left out. Some of the tools and techniques currently in use are listed below:

a. Student-instructor/facilitator (live or virtual, synchronous or asynchronous) types of interaction include:

(1) Workshops.

(2) Mentoring.

(3) Practice, demonstrations, and simulations.

(4) Webinars.

(5) E-mail.

(6) Chat.

(7) Threaded discussion.

(8) Whiteboard (Web-collaborative).

(9) Video teleconference.

(10) VTT.

b. Student-student (live or virtual, synchronous or asynchronous) types of interaction include:

(1) E-mail.

(2) Chat.

(3) Threaded discussion.

(4) Whiteboard (Web-collaborative).

(5) Video teleconference.

(6) VTT.

Appendix E
SCORM

E-1. SCORM description

a. SCORM. SCORM is a packaging and communication standard for Web-delivered content. Packaging refers to the standard followed when compressing the content into a .zip format. SCORM uses the package interchange file extension.

Note: The important thing to remember about SCORM is that it is for Web-based courseware. If it does not need to play on the Web, it does not need to be SCORM conformant.

b. SCORM run-time environment. The SCORM runtime environment is concerned with launching content objects, communicating with an LMS, and exchanging data elements between the LMS and content during its execution. The runtime environment describes LMS responsibilities for sequencing content objects and allowing SCOs to indicate navigation requests. The launch process defines a common way for an LMS to start reusable learning

content objects and defines procedures and responsibilities for the establishment of communication between the launched content object and the LMS.

c. Reusable learning objects. Learning content is generally developed as courses, modules, or lessons — each full of resources such as animations, simulations, graphics, video, and audio. New technical standards were developed to open these resources to discovery and reuse. These standards allow for separation of all the pieces of learning content making it available to other course developers. Reusable learning objects are small chunks of learning content that can be tagged with descriptive labels (metadata) and made discoverable by other developers. Other benefits include the ability to:

(1) Use existing content to create new courses throughout the U.S. Government.

(2) Use multiple delivery channels (Internet, intranet, print, and more).

(3) Provide efficient and cost-effective content revisions by easily updating content.

(4) Improve course development efficiently in a timely manner.

(5) Assemble new courses and other deliverables from existing content, in whole or in part.

d. SCORM Content Model components. The SCORM Content Model describes the components used to build a learning experience from learning resources. The SCORM Content Model also defines how these lower-level sharable, learning resources are pulled together (aggregated) into higher-level units of instruction. The SCORM Content Model is made up of assets; SCOs, and content organization. SCOs and assets are two types of reusable learning objects used in SCORM.

(1) Assets. SCOs are made up of assets. These can be as small as an individual hypertext markup language Web page or as large as an entire Web site. For example, a lesson (SCO) might contain a simulation (asset), a glossary (asset), and a check-on-learning (asset). All of the graphics are also assets and are part of the lesson.

(a) From a development perspective, an asset is any object that should be isolated because it has potential for reuse. This isolation should make it easier to build, maintain, and update content that contains the asset.

(b) Assets can be effectively managed using a content management system or an LCMS. Identification of assets with appropriate metadata assists in their discovery and reuse. This metadata may be as simple as an identifying label, or it may include information on educational strategy, technical requirements, and digital rights. Assets are an important type of reusable learning object that play a key role in the development process but SCORM places no conformance requirements on assets.

(2) SCOs. SCOs are reusable learning objects that can be launched and tracked by communicating with an LMS. It is this communication with an LMS that makes a SCO a SCO. Without this, a SCO is just a collection of assets. SCOs should be developed to support specific

instructional objectives. An entire course could be a SCO if there is no instructional reason to break it into smaller pieces.

(a) Learning content may be broken down into pieces to make it more reusable. For example, an assessment might be a SCO if it communicates with the LMS. If it needs to be part of a larger piece of content, then it might best be treated as an asset within a SCO and would not then need to communicate with the LMS as its parent (the SCO) will perform that function.

(b) There are limitations inherent in SCORM that can influence development decisions. SCORM specifications allow a SCO to communicate with an LMS but not with another SCO. This limitation ensures a SCO can be discovered and reused in other courseware.

E-2. Sharable content object (SCO) dependence

Another important consideration for the development team is the concept of SCO dependence. To improve reusability, a SCO should be designed independent of learning context. To attain this freedom from content, SCOs are usually formed from the smallest part of learning content (for example, an animation depicting electrical troubleshooting instead of the complete lesson in electrical diagnostics). The complete lesson may have references too specific for other developers to use. A SCO is considered dependent if the graphic design elements or the sequence and navigation design are tied to a specific context or content.

E-3. Army classification of SCOs

The Army supports different classifications or purposes of SCOs relating to reusability. Independent SCOs are intended to teach the task without reference to a context (for example, MOS title), whereas dependent SCOs have fewer restrictions and can relate to context or provide a transition between tasks. Certain rules may apply to one type of SCO and not another.

a. Independent SCOs. These SCOs are "independent," meaning they are context-neutral and contain learning content and/or graded assessments. Context-neutral implies the absence of the MOS and removal of the course, module, and lesson titles. Army structure terms like course, phase, module, lesson, etc., are also removed. Independent SCOs are considered "reusable" and could be stored in a SCO repository to be available to other developers for use in another course with little or no modification required.

b. Dependent SCOs. These SCOs are developed to establish the context of an otherwise context-neutral group of SCOs, such as a course or module introduction or a course overview SCO. Also included would be SCOs that transition the student between content. For example, a dependent SCO could be developed to transition from an introduction SCO to an independent SCO, or between two independent SCOs. Dependent SCOs are not reusable, because of dependence on the course context and are limited as a "single use" SCO. Dependent SCOs such as introduction SCOs or transitional SCOs that have non-instructional content, may reference learning objectives, course content, etc., for the student to understand what will be taught. This is acceptable to the Army. The Army considers these dependent SCOs as "single use" objects and not reusable.

c. SCO granularity. Granularity refers to the smallest level of detail at which information can be viewed or addressed (see figure E-1). SCO granularity refers to its size. SCORM does not

dictate the size of a SCO. This decision is left up to the developer. As a SCO is the basic building block for SCORM-conformant courseware, it is preferably the smallest part of a course and could be text, a graphic, an animation, or an assessment. Remember, the smaller the SCO the more likely it can be reused.
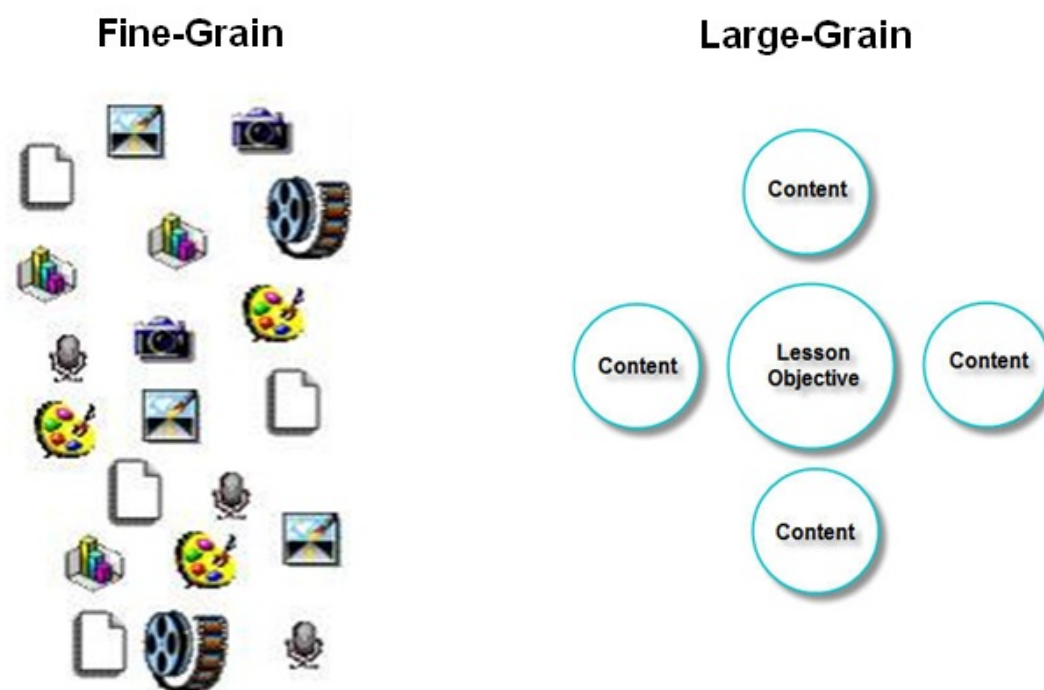
Figure E-1. SCO granularity

E-4. SCO size considerations

a. Size is based on student engagement. Research studies have suggested that the average adult can participate in e-learning with understanding for approximately 50 minutes and for retention for approximately 20 minutes. Students must be engaged with the content at least every 8 minutes. This suggests that a SCO should be no more than 90 minutes, contain internal logic to provide the student logical break points and changes in pacing at approximately 15- to 20-minute intervals, and have some student involvement/student activity at least every 8 minutes.

b. Size is based by chunk. In traditional learning products, content is presented in 1- to 3-hour chunks (a normal class period). Learning objects are much smaller chunks of content designed to be self-contained, reusable, and easily gathered together (aggregated) into bigger chunks.

c. Size is based on course structure. SCORM does not change Army course structure but there are new concepts for developers to consider. A course is no longer a set of context-specific learning instruction. Its meaning, as previously understood, has changed. Within SCORM, a course contains reusable, dependent, and independent learning objects with externally applied

sequencing rules. It is this separation of the content into smaller portable chunks that allows reusability.

(1) SCOs are intended to be subjectively small units, such that potential reuse across multiple learning objects is feasible. SCORM does not impose any particular constraints on the exact size of a SCO.

(2) The instructional design and assessment strategy of the learning product drives the size of SCOs and is usually documented in the DO for the course/content being developed. However, the smaller the SCO, the more possibility of reuse. The TLO level is usually too high for SCO reuse. SCOs at the ELO level or lower, such as LSA level, offer better reuse. Whatever the size, the design must meet the desired course educational strategy.

(3) The size of each chunk is part of the design decision but, generally speaking, it is the smallest part of the learning structure. In Army course structure this is the ELO. SCOs can appear in different parts of the course structure based on design decisions. Examples are:

(a) LSA. A SCO can be below an ELO, but this is not normally done in Army learning products. This level is usually an asset used by the SCO.

(b) ELO SCO. This is the foundation of a course.

(c) Lesson introduction SCO. A lesson introduction SCO provides an overview of the lesson content. This is an example of a dependent SCO because an introduction is specific to the content being introduced.

(d) Lesson assessment SCO. A lesson assessment SCO includes knowledge checks, PEs, or pre-assessment and post-assessments based on the learning objectives and method used for fielding. This may be context specific and, therefore, a dependent SCO, or it may be independent of contextual material.

(e) Module introduction SCO. A module introduction SCO provides an overview of the module content and is a dependent SCO.

(f) Module assessment SCO. A module assessment SCO includes simple and/or complex assessment items/scenarios based on the objectives. This is most likely a dependent SCO. The higher the hierarchical level, the more context specific a SCO becomes.

(g) Course/phase introduction SCO. A course/phase introduction SCO outlines the scope of the course and the parameters for student participation. This is an example of a dependent SCO because of the content.

(h) Phase assessment SCO. A course assessment SCO (pre-assessment and post-assessment) provides simple and complex assessment items based on the course objectives. This is most likely a dependent SCO. The higher the hierarchical level, the SCO becomes more context specific.

E-5. SCO reuse

   a. In the past, courseware was developed with all of the navigation and sequencing information embedded within the learning content. Reuse was difficult and sharing learning content between authoring systems was impossible. SCORM standards allow for new sequencing possibilities. Essentially, SCORM has brought about a new technical paradigm for content development. Navigation, sequencing, mastery score, etc., are moved externally to bring about learning content that is reusable. The reusability of a learning object depends on it being context independent and without links to other learning objects. Each SCO must have associated metadata and be part of a SCORM content package. Content packages are registered in the Advanced Distributed Learning Registry (ADL-R).

   b. The reusability of a learning resource depends on it being independent and self-contained. SCORM recognizes, however, that some learning resources may contain internal logic to accomplish a particular learning task. Such a learning resource might branch within itself depending on user interactions. These branches are all self-contained, relevant to a stand-alone learning resource, and are not usually visible to the LMS. Importantly, internal branching must not reference external learning resources that may or may not be present in other content organizations. This is an important area that developers should pay attention to when determining what learning resources should be used and how they are to be aggregated.

       (1) Metadata. Metadata is information describing characteristics of data (in other words, your courseware content). Metadata enables those searching for content to locate it relatively easily. For example, courseware that is described with discovery metadata (such as "truck engine," "3-D animation") may be systematically searched for and retrieved for use. See table E-1 for some examples of metadata.

Table E-1
Metadata examples

Content	Metadata
1. Can of vegetables	Batch date, expiration date, and description of contents.
2. Library catalog entry	Call number, title, author, format, publisher, copyright date, etc.
3. SCO	Title, language, technical and pedagogical details.

       (2) SCORM content packaging. It is recommended that all SCOs (content and graded assessments) for a particular unit of instruction be contained in one content package. A SCORM content package must contain a manifest file and all of the SCORM content.

Note: Earlier SCORM versions may differ; check version specifications for more details.

(3) Manifest file. The manifest file (called imsmanifest) is an XML file that describes the entire courseware package, just like a shipping manifest lists everything that is shipped. The manifest file links your courseware files to the table of contents in the LMS. For SCORM to control sequencing of an entire course, the entire course needs to be in one content package. If the LMS is to handle sequencing between lessons, only the elements of the lesson need to be in the content package. This is required for incremental fielding of courseware.

(4) Storing SCOs for reuse. As stated earlier, each SCO must have associated metadata and be part of a SCORM content package. Ensure that content packages are registered in the ADL-R. This process has been compared to storing a book in a library. The book is described in a card catalog that enables a user to retrieve it. The registry is the card catalog and the repository is the library.

(a) ADL-R. The ADL-R is a DoD service for registering the existence, location, description, and other relevant properties of DL content developed or acquired by DoD. The ADL-R provides a central, searchable set of records representing DL content objects. All new SCORM content packages shall include metadata, be registered in the ADL-R, and be maintained in DoD components' repositories that are searchable and accessible.

(b) Army content repository. The CAR is registered with the content registry (ADL-R) as the official repository for Army learning products and doctrine. Interaction with the registry by proponent schools will be through the CAR, consisting of specific metadata elements. Web-based instructional content contained within lifelong learning centers is subject to inclusion within the ADL-R. Figure E-2 depicts reusable SCOs in the CAR.

Figure E-2. Reusable SCOs in the content repository

(c) Search for reusable content. In the planning stages of learning product development, a developer goes to the ADL-R at http://adlregistry.adlnet.gov// to determine if there is usable learning content. The ADL-R is an online environment where SCORM-conformant content objects are accumulated and managed for broad distribution and use. Enter keywords to search the repository for content that can be reused. These content objects can be used for in-house

development of DL or provided as GFI to a contractor working on development of DL for the government.

Appendix F
Multimedia Element Guidelines

F-1. Multimedia list
Develop a list of the multimedia elements that will be incorporated in the courseware. Multimedia elements such as graphics, video, audio, animations, and photos will be developed upon the completion of the storyboards. These are furnished to the contractor as part of the GFI.

F-2. Visual guidelines
The following are visual guidelines or recommendations for content layout, appearance, text development.

    a. When developing the content layout, ensure that it is visually pleasing and provides for smooth flow from screen to screen. Place key information in prominent areas (such as away from the border) and present recurring information (such as titles) in constant locations.

    b. Content layout should be clear and have continuity. This means it should be consistent regarding standardization of controls, screen placement, writing techniques (style, titles, text fonts, etc.), audio, special effects, color, and cues. Provide consistent layout for the same types of screens (for example, checks-on-learning) within a given course. Develop and use content layout templates when possible to maintain consistency and to speed the development process. Figure F-1 is an example of a content layout template.

Note: Material gathered from DAVIS/DITIS and/or ADL repositories are not expected to be consistent with the new material being developed.
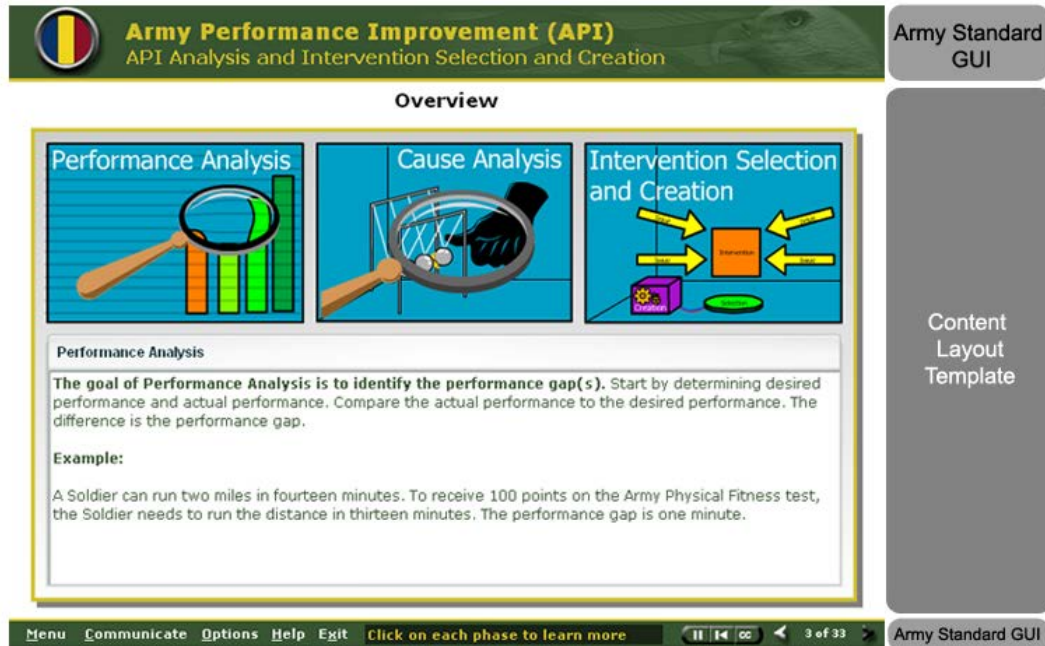
Figure F-1. Interactive graphic with text on bottom

c. Use these guidelines for content appearance:

(1) Present information in a top-down, left to right format.

(2) Ensure that key details are easily identified.

(3) Standardize locations on the screen to display specific instructions/prompts for students.

(4) Incorporate text that describes or labels visual elements within the graphic itself whenever possible.

(5) Integrate diversity (gender, ethnic groups, etc.) appropriate to the target audience when developing content including graphics, animations, and text.

(6) Use color consistently. Each color should have a clear and consistent meaning.

(7) Ensure adequate contrast between text and background colors.

(8) Avoid hues of colors that bleed into the background.

(9) Use underlines or an image to indicate links. Color alone may not be seen by students who have difficulty perceiving color.

(10) Design rollovers with a change in image or text. Changes in color alone may not be seen by students who have difficulty perceiving color.

(11) Use bright colors. Some students can see all colors but have a difficult time distinguishing them if they suffer from color weakness.

   d. Well-structured text enhances readability, increases understanding, and aids recall of information. Use the following guidelines for text presentation:

       (1) Include a visual element (graphic, animation, video, etc.) that directly relates to the text whenever possible. See figure F-2.

Figure F-2. Visual element relating to text

       (2) Incorporate any needed on-screen text within the visual element rather than use captions, whenever possible.

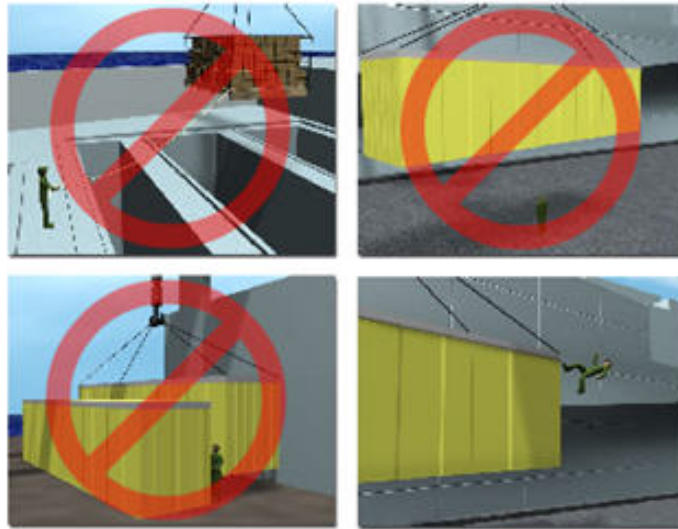   (3) Limit the amount of text on the screen.

       (4) Put cautions, warnings, environmental protection factors, or exceptions to some prescribed action before the instructions. See figure F-3.

Figure F-3. Incorporate safety warning in graphic

(5) Organize text into small but logical chunks of relevant information.

(6) Keep text simple and direct.

(7) Use a conversational and personalized style rather than a formal style.

(8) Use short sentences and paragraphs. Break up lengthy sentences using bullets, numbered lists, tables, and/or charts.

(9) Provide generous white space to separate blocks of text.

(10) Start paragraphs with the main idea, and follow by topically related subordinate text.

(11) Provide students with the necessary information in the fewest possible steps in the shortest time possible.

(12) Address only one concept, procedure, or item of instruction on a screen, unless it is instructionally necessary or common sense to do otherwise (such as to compare/contrast or to present a short series of familiar steps). See figure F-4.

Hand Signals for Cranes

Slew/Rotate Crane

- Arm extended

- Point in desired direction
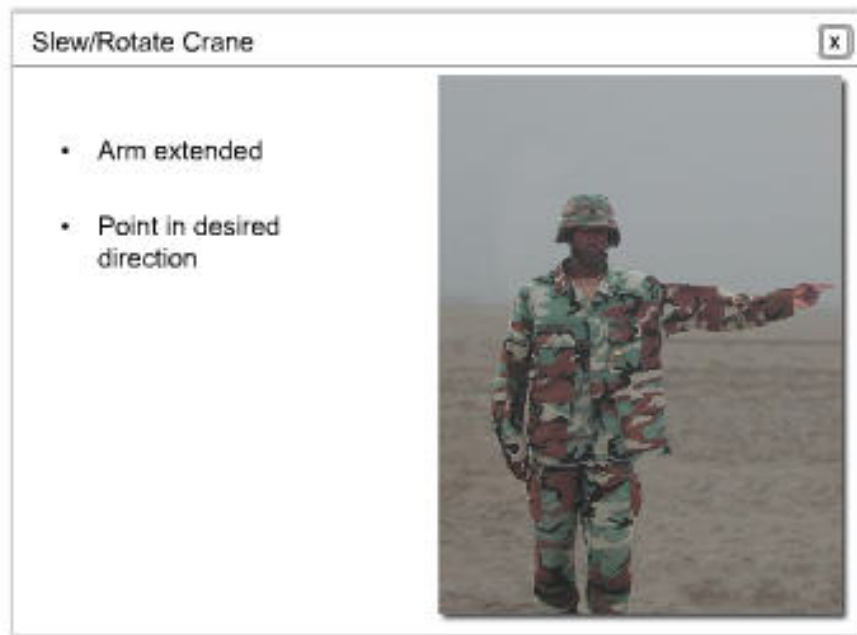
Figure F-4. Screen showing one procedure

(13) Make clear the transition from one concept to another.

(14) Maintain parallel construction, noun-pronoun, and noun-verb agreement.

(15) Use active voice as much as possible.

(16) Use bold for emphasis. Avoid underlining except for hyperlinks.

(17) Align text flush left, ragged right. Avoid indenting paragraphs.

(18) Use uppercase words sparingly (for example, titles). Avoid using words in all uppercase.

(19) Hyperlink glossary words, when appropriate.

(20) Avoid scrolling by using more pages when presenting large amounts of text.

(21) Avoid using paragraphs of on-screen text, narration, and visual elements (graphic, animation, video, etc.) simultaneously.

   e. Audiovisual guidelines, strategies, production, and deployment considerations template. Audio and visuals should only be used when there is a training/education need and help to enrich the learning experience. The audiovisual http://www.atsc.army.mil/tadlp/content/index.asp guidelines, strategies, production, and deployment considerations template is located at to assist in design considerations.

f. Visuals present information with some type of graphic. Use only visuals that relate directly to achieving the learning objective and content. Use the following guidelines for visual elements:

(1) Selection of the graphics format should be balanced by the bandwidth required and the characteristics necessary to support the learning objective (still picture, animation, narration, etc.).

(2) Ensure graphics, photos, and animations have a consistent appearance by establishing standards (backgrounds, size, and color of borders, etc.).

(3) When possible, incorporate any needed on-screen text within the visual element rather than use captions. See figure F-5.
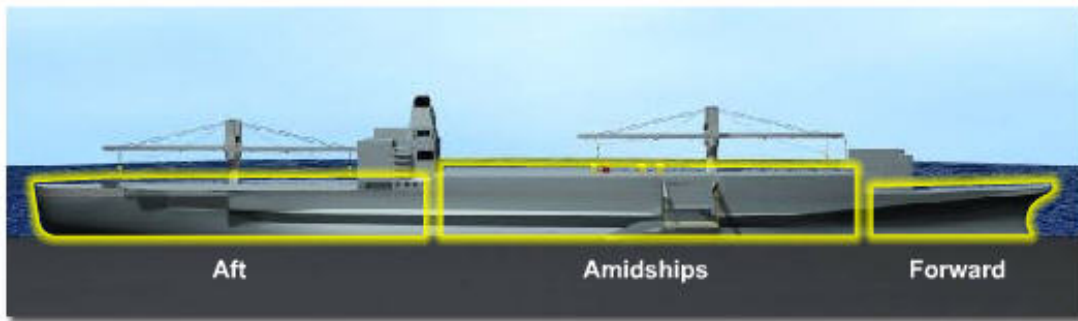
Figure F-5. Screen text incorporated in graphic

(4) Use visual representations of text (graphic organizers, concept maps, hierarchies, matrices, flowcharts, etc.), whenever possible.

(5) Reuse graphics to reinforce basic concepts.

(6) Provide recurring information in consistent locations (for example, buttons, navigations, etc.).

(7) Maintain a constant perspective in a series of visuals. Cue the students if a change of perspective is necessary.

(8) Title charts clearly with appropriately sized fonts.

(9) Avoid overloading charts with small symbols or graphics.

(10) Avoid cluttering the screen with too many visual elements.

(11) Do not include brand name, contractor, or other corporate logos.

g. Static graphics include photographs, clip art, drawings, charts, and tables. Use the following guidelines for graphics and photos:

(1) Ensure adequate contrast between subject and background colors.

(2) Ensure that key details are easily identifiable. Avoid using too many visual cues or too many colors at once.

h. Use the following guidelines for animation:

(1) Design animations appropriate for the target audience.

(2) Where possible, combine animation with narration rather than with chunks of on-screen text.

(3) Where instructionally sound, incorporate student interaction into animations.

(4) Allow students to play, pause, and repeat animation.

(5) Use animation to show key concepts that are difficult, impossible, or cost-prohibitive to describe otherwise, especially when the animation (or parts of it) can be reused elsewhere in the course, or on a splash screen.

(6) Match the duration of animation with narration to avoid long pauses.

(7) Reserve blinking for critical situations requiring immediate attention or action.

(8) Avoid animation that wanders across the screen or otherwise distracts students from the content.

i. Interactive graphics.

(1) Allow students two opportunities to complete the interactivity whenever possible.

(2) Provide descriptive feedback on the same screen, if applicable.

j. The following are guidelines for three-dimensional graphics.

(1) Use to show key concepts that are difficult to describe, or are impossible or cost-prohibitive to photograph or film.

(2) Consider using when the graphic or parts of the graphic can be reused elsewhere in the course to save on overall development time.

(3) Consider "hybrid" animations that use three-dimensional imagery and two-dimensional animations to reduce file size.

k. 3-D visualizations. Use the following guidelines for 3-D visualizations:

(1) Ensure equipment parts are recognizable.

(2) Allow students to drill down to greater detail.

(3) Limit the number of individual parts, preferably less than 50.

(4) Consider using colors instead of textures on some, or even all, parts unless instructionally necessary.

(5) Reduce or eliminate backgrounds unless there is an instructional need to display them.

l. Real-time simulations. Use the following guidelines for real-time simulations:

(1) Use when the student must act on realistic scenarios without attendant dangers and inefficiency (time and money).

(2) Use for exploration and reflection.

(3) Incorporate demonstrations, coaching, and explanations whenever possible.

(4) Consider making levels of increased difficulty (beginner, intermediate, and advanced).

(5) Consider video technical recommendations for appropriate situations. For example provide formats in H.264 at SVGA or WVGA resolutions to target mobile devices but alternative resolutions such as MPEG2 at 720×480 would be appropriate for DVD delivery.

F-3. Video guidelines

As video consumes memory and bandwidth, only use it when it is essential to teach a specific learning objective. This section addresses basic video guidelines. See the following documents for detailed video information: DoDI 5040.2, DoDI 5040.6, DoDI 5040.07, AR 25-1, and DA Pamphlet (Pam) 25-91. The DA Multimedia/Visual Information Production and Distribution Program (DAMVIPDP) is developed annually by ATSC for funding and production support. Call 1-800-275-2872 or e-mail ask.ATHD@us.army.mil for point of contact information. Use the following guidelines for video:

a. Use video to reinforce, clarify, or emphasize a specific learning objective that cannot be effectively taught using graphics, stills, photographs, or animations.

b. Use appropriate methods of instruction (demonstration, panel discussion, guest speaker, etc.) for the content presented.

c. Light the main subject well and eliminate background distractions.

d. Use video or graphic window overlays to show extreme close-ups of small objects, such as wide-angle views for knobs and switches.

e. Allow students to play, pause, and repeat video.

f. Play video automatically as soon as the page is loaded unless there is an instructional need for the student to initiate it (then provide a "play" button).

g. Allow the student to proceed without viewing the video.

h. Use a separate page for video scripts and reference the corresponding screen number. Use a two-column format. In the left column, describe the scene to be produced. In the right column, state the actual words to record.

i. Plan video segments in advance of the editing process to avoid excessive costs.

j. Film several takes of the same scene or subject with adequate footage before and after to facilitate editing.

k. For Web-based delivery, avoid traditional techniques (zooming, panning, transitional wipes and dissolves, fast motion subjects, etc.) that increase the duration and file size unless they are instructionally necessary.

Note: Audio with a photograph is often just as effective as a video of a talking head. Use the talking head format only when an expert is used to motivate the students.

F-4. Audio guidelines
The following are guidelines for planning audio elements.

a. State in the storyboard the actual words or sounds to record. If additional space is necessary, add a page.

b. Provide complete closed captioning.

c. Spell out all numbers for the script/narration.

Note: This is not meant for on-screen text.

d. Do not have the narrator read on-screen text read word for word. Indicate how to pronounce acronyms and unfamiliar words for the script/narration (for example, A-T-S-C).

Note: This is not meant for on-screen text.

e. Use a conversational style rather than a formal style.

f. Use short sentences and define acronyms, if used.

g. Provide students with the necessary information in the fewest possible steps, in the shortest time possible.

h. Make clear the transition from one concept to another; use transitional words such as first, second, next, as a result, etc.

i. Use active voice whenever possible.

j. Allow students to play, pause, and repeat audio.

k. Allow students to proceed without playing audio.

l. Write narration and dialogue to include a preview summary that outlines the main steps.

m. Organize narration and dialogue into short, logical chunks that are simple and direct.

n. Set narration to play automatically (as soon as the page is loaded) for individual page narration.

o. Write narration that supports on-screen text and graphics, rather than competes with them.

p. Use combinations of narration and visual elements rather than combinations of paragraphs of on-screen text and visual elements.

q. Match the duration of narration with animation to avoid long pauses.

r. Use sound effects to add realism, when appropriate.

s. Avoid sound effects that indicate correct or incorrect responses, as they can quickly become irritating.

F-5. Text guidelines
Text is used to present information and communicate ideas, procedures, and concepts. Text that is cluttered and hard to read does not help to accomplish any of these goals. The following are guidelines for planning text elements.

a. Place text as it will be read (left to right and top to bottom).

(1) Minimize text on a single screen.

(2) Be concise.

(3) Do not scroll the text, if information is critical.

(4) Select text sizes and fonts that are easy to see and read.

(5) Use fonts that are san serif (without flourish) for on-screen and Web-based viewing. Use of text types or fonts with a flourish known as serif can result in poor readability.

(6) Determine text size based on the students' ability to easily see and read the information. Size is determined by font selection. General guidelines are headings, 48 points; titles, 36 points; and body, 24 points, but these may change based on font selection.

(7) Remain consistent in font size and type throughout the material.

(8) The following are guidelines for selecting text color.

(9) Avoid using high chroma, brilliant, or electric colors for text fields since they make reading difficult.

(10) Ensure text and graphic colors contrast with background color.

(11) Use color text combinations that aid reading or viewing.

(12) [12]Use white or light yellow text for dark backgrounds.

(13) Use blue, black, or dark text for light backgrounds, such as beige.

(14) Use color background combinations to identify the type of screen (procedure, checks-on-learning, caution, warning, menu, etc.).

(15) Specify color combinations in the IMI design strategy conventions.

b. There are many way to enter text into IMI. The entry method depends on authoring tools used in the design. The following are guidelines for entering text.

(1) Typing with a keyboard directly into an authoring tool is the normal method. This must be done keeping students in mind. View the text in the same manner the students will see it to ensure the text is of appropriate size, color, and contrast.

(2) Scanning or importing text as a graphic image may be an option. While this method is possible, caution must be exercised. A scanned image may lose resolution when stretched to fit a design.

(3) Using a graphic representation of text can result in poor, unreadable text. Use caution with this technique.

Appendix G
Technical Specifications and Guidelines

G-1. Technical specifications and guidelines overview
This appendix offers guidelines on the technical requirements and specifications for Web-based and CD-ROM-based courseware.

**G-2. Minimum technical requirements for Web-based multimedia files and screen sizes**
Army Web-based learning product minimum technical requirements ensure uniformity throughout the Army IMI inventory, particularly as they pertain to the functionality on baseline computers. See appendix C.

G-3. Configuration and Army Learning Management System (ALMS) standards
These requirements are based on the current DTF student workstation configuration and the baseline home computer configuration for IMI courseware. When developing courseware, always consider the latest configuration of your target population's deployment environment. Design all courseware to function within the ALMS and to comply with the acceptance criteria for SCORM 2004 courseware and the Business Rules, Best Practices, and Examples for Army SCORM 2004 Conformant Courseware.

G-4. Screen resolution and window size
Develop content for a window size that fits inside the screen resolution of your target population's deployment environment. Currently, the majority of computers can meet a screen resolution of 1024 x 768 pixels. When selecting a window size, ensure that the operating system's taskbar (also known as the start bar) and the browser's title bar, standard buttons, address bar, and status bar are visible to the user in their default position. Consider the measurement of the various components. Students should see all of the content and the graphic user interface (GUI) without scrolling (unless scrolling is part of the instructional design). Navigation features must always be available. See figure G-1.
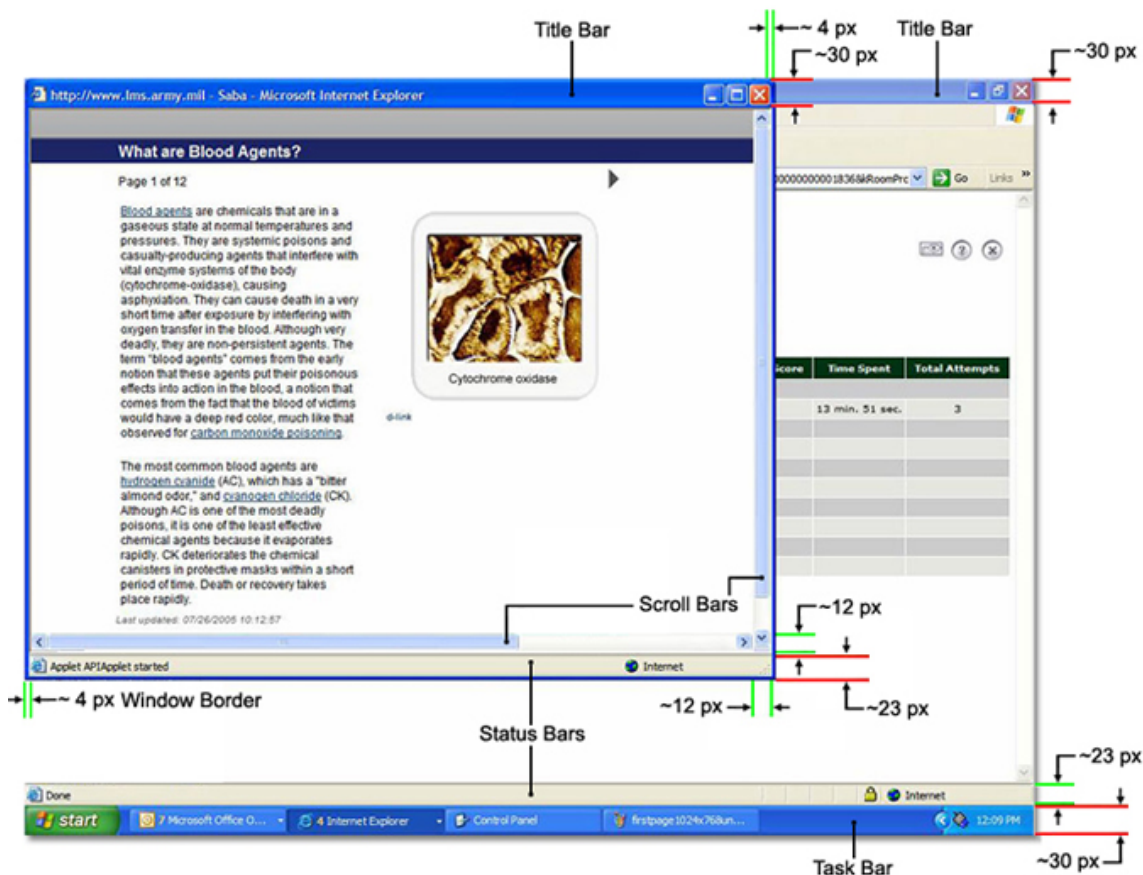
Figure G-1. Determining window size

Note: Due to security issues, you cannot turn off the window's title bar or its bottom status bar. Also, expect students to have their taskbar visible.

G-5. File size
Optimize the size of all files for the online browser environment. The primary concern is the impact on learning.

   a. Provide a loader and progress bar if there is a significant lag between the time the student requests a page and the page fully loads.

b. Average times for latency periods are: ideally 5 seconds, acceptable at 10 seconds, and maximum is 30 seconds.

c. The approximate download times in table G-1 are based upon ideal conditions using optimum downloading speed. Times will vary depending on actual area (computer, local network, city, etc.) connection speed as well as network and Internet congestion.

Table G-1
Approximate download times

Internet connection	Approximate time to download 1 MB
640 kilobits per second digital subscriber line	12 seconds
728 kilobits per second cable	10 seconds

d. Strike a balance between file size and file quality. For example, when finer detail must be clear, the file size must usually be larger.

G-6. Graphics
Use the following guidelines for graphics:

a. Formats for graphics include: Joint Photographic Experts Group (jpeg), graphic interchange format, and portable network graphic.

b. Design raster images for display at 72 dots per inch of detail.

c. Use a 24-bit super video graphics array color environment.

d. Use 256 colors for graphic interchange format files.

Note: Gif files can be dithered down to smaller color palettes (for example, 8 or 128 colors) to further compress the file.

e. Use 24 bit colors for portable network graphic files.

f. Use Web-safe colors when choosing colors for text, backgrounds, and graphics.

g. Design graphics so they appear on the screen before text or captions, if the graphics do not appear simultaneously with text items.

h. Do not use animation file formats to present text and simple photos or graphics. It increases file size and complicates timely revision of text.

i. Place each graphic on a hypertext markup language page using the <img> tag.

j. Include the alternate text (ALT) attribute. Its value will be a description or explanation of the image.

k. Include the height and width attributes set to the actual size of the image.

G-7. Streaming media
Use the following guidelines for streaming media:

a. Courseware that presents streaming media should verify that a streaming protocol connection can be made before executing a streaming media request. Execute the alternate path if the streaming protocol connection fails. The alternate path should specify an alternative protocol, for example, hypertext transfer protocol (HTTP) and file transfer protocol (FTP). Provide this functionality with minimum inconvenience to the student.

b. Developers using streaming media may implement this guidance using synchronized multimedia integration language and switch variables; however, any implementation that minimizes student inconvenience and guarantees media access is encouraged. When and if the inaccessible streaming media issue is resolved, the implementation of this guidance should not inhibit student access.

G-8. Video
Use the following guidelines for videos:

a. Record original video in high-quality digital format.

b. Save video sources using an uncompressed format.

c. For Web presentation, resize or compress video files as appropriate.

d. Maintain video resolution throughout the course.

G-9. Audio
Use the following guidelines for audio:

a. Record original audio in high-quality format (44 kilohertz, 16 bit mono/stereo).

b. Save audio sources using an uncompressed format.

c. For Web presentation, compress audio files as appropriate.

G-10. Three-dimensional (3-D) graphics
Target the following file sizes for 3-D visualizations:

a. Preferred: 2 MB

b. Acceptable: 5 MB

c. Maximum: 7 MB

   d. Use available file size reduction options.

   e. Use available progressive file transmission options.

   f. Optimize file loading using available best practice options

G-11. Emerging technologies
The concepts described above also pertain to emerging technologies. If you plan to use emerging technology or a technology not covered in this document, you must get approval from your proponent and ATSC. This is to avoid issues with runtime and royalty fees, licenses, copyrights, bandwidth, approval for use on Army networked systems, etc.

Appendix H
End-of-Course Survey Sample
The following is an end-of-course survey sample.

Administrative Guidance:

   a. This survey is a quality control tool that helps us improve the instruction we provide.

   b. Participation in this survey is mandatory.

   c. As a student, you have valuable information and ideas that can help us improve the quality of instruction for students who follow you. We appreciate your taking the time to provide your input.

   d. For each question put an" X" in a box next to one of the responses.

   e. You can add comments in the remarks section at the end of this critique.

   f. You can add your name at the end of the critique if you choose or want to discuss some aspect of the education/training provided.

Introduction
We, at the Army Training Support Center (ATSC), want to ensure that the instruction we are offering meets your needs as a student. Please take a few minutes to respond to this course evaluation honestly. We take your comments seriously, so please complete the entire survey. For questions that give the range of 1 through 7 as the expected response, please use the table below as a guide.

The number:	Means that:
1	You strongly disagree.
2	You moderately disagree.
3	You disagree.
4	Neutral.
5	You agree.
6	You moderately agree.
7	You strongly agree.

Demographics	
1. What is your military component?	☐ Active Army ☐ U.S. Army Reserve (USAR) ☐ Army National Guard ☐ Military branch other than Army ☐ Civilian ☐ Contractor
2. What is your grade/rank?	☐ Military E1-E5 ☐ Military E6-E7 ☐ Military E8-E9 ☐ Military O1-O3 ☐ Military O4-O5 ☐ Military O6 ☐ Military GO ☐ Military W1-W2 ☐ Military W3-W4 ☐ Military W5 ☐ GS 1-5 ☐ GS 6-8 ☐ GS 9-11 ☐ GS 12-13 ☐ GS 14-15 ☐ Senior Executive Service ☐ None

3. If military, how long have you been serving in the MOS for which you are taking this course?	☐ N/A
	☐ I have not served in this MOS.
	☐ Less than 6 months
	☐ 6-11 months
	☐ 1-2 years
	☐ Over 2 years
	☐ This course is not specific to my MOS.
Background	
4. How much experience do you have related to the subject matter of this course?	☐ N/A
	☐ None
	☐ A small amount
	☐ A moderate amount
	☐ A substantial amount
5. Why did you take this course?	☐ The course was required for my job.
	☐ Self-development
	☐ Reachback or refresher training
	☐ Other
Course Content	
6. This course clearly explained important terms and concepts.	☐ N/A
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)
7. This course clearly demonstrated how to perform procedures.	☐ N/A
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)

8. Practical exercises and checks-on-learning helped me to learn the course material.	☐ N/A ☐ 1 (Strongly Disagree) ☐ 2 (Moderately Disagree) ☐ 3 (Disagree) ☐ 4 (Neutral) ☐ 5 (Agree) ☐ 6 (Moderately Agree) ☐ 7 (Strongly Agree)
9. There were enough practical exercises and checks-on-learning in this course.	☐ N/A ☐ 1 (Strongly Disagree) ☐ 2 (Moderately Disagree) ☐ 3 (Disagree) ☐ 4 (Neutral) ☐ 5 (Agree) ☐ 6 (Moderately Agree) ☐ 7 (Strongly Agree)
10. If I made a mistake, the feedback adequately explained why I was wrong.	☐ N/A ☐ 1 (Strongly Disagree) ☐ 2 (Moderately Disagree) ☐ 3 (Disagree) ☐ 4 (Neutral) ☐ 5 (Agree) ☐ 6 (Moderately Agree) ☐ 7 (Strongly Agree)
11. The length of the course (amount of course material) was about right.	☐ N/A ☐ 1 (Strongly Disagree) ☐ 2 (Moderately Disagree) ☐ 3 (Disagree) ☐ 4 (Neutral) ☐ 5 (Agree) ☐ 6 (Moderately Agree) ☐ 7 (Strongly Agree)

12. The level of difficulty of the course was about right.	☐ N/A
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)
13. I already knew a lot of the material covered in this course.	☐ N/A
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)
Technical	
14. What type of Internet service did you use to take all or most of this course?	☐ High-speed, broadband connection (for example, digital subscriber line, cable, T1 line, or Ethernet connection)
	☐ Dial-up
	☐ None. I took the course on CD-ROM
	☐ Not sure
15. Did you experience any of the following in this course? Check all that apply.	☐ Delay in pages loading
	☐ Difficulty in returning to the spot where you left off after logging off or closing the courseware (intentionally or unintentionally)
	☐ Lost data, such as scores on PEs or assessments
	☐ Text on the screen that was hard to read
	☐ Audio narration that was too slow or too fast
	☐ Sounds, graphics, or animations that were distracting
	☐ Other

16. Did you experience any of the following difficulties in this course? Check all that apply.	☐ Difficulty registering for the course
	☐ Difficulty accessing the course over the Internet
	☐ Difficulty receiving the course on a CD-ROM in the mail
	☐ Difficulty launching the course
	☐ Difficulty navigating through the course
	☐ Difficulty determining where you were within the course
	☐ Difficulty playing audio, video, or running animations in the course
17. Overall, I was satisfied with the technical features of this course.	☐ N/A
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)
Interactivity: For the following questions, interactivity is defined as the way in which you interact with the media (buttons, pictures, sound, and text) on the computer screen).	
18. I was able to easily move to the next lesson, skip content, and move forward or backward.	☐ N/A
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)
19. The audio and/or video assisted in learning the material.	☐ There was no audio or video.
	☐ 1 (Strongly Disagree)
	☐ 2 (Moderately Disagree)
	☐ 3 (Disagree)
	☐ 4 (Neutral)
	☐ 5 (Agree)
	☐ 6 (Moderately Agree)
	☐ 7 (Strongly Agree)

20. The techniques used in the lessons helped with learning and retaining the material. Check all that apply.	☐ N/A ☐ Audio ☐ Video ☐ Animation ☐ Games ☐ Chat ☐ Threaded discussion
21. After reflecting on the control of content, describe any issues you had with playing the courseware that limited your control (such as slow loading of pages, graphics not loading, or audio/video not playing). Check all that apply.	☐ I had to wait for audio to play before I could advance. ☐ I had to wait for video to play before I could advance. ☐ I had to click all the buttons before I could advance. ☐ I had to wait for pages to load.
22. Overall, which of the following had the biggest effect on your satisfaction with this course? Check all that apply.	☐ The technical support features of the course, including course/technical support ☐ The multimedia content (the audio, video, animation, and/or pictures) ☐ Ease of use. The amount of time I had to work on the course ☐ Control of which lessons to view (sequence) and how quickly I could advance (pacing)
Remarks.	

Appendix I
Components of the IMDP Process
Table I-1 lists and describes common IMDP requirements. These components include front matter prepared IAW MIL-PRF-29612B, and the summary description of training IAW DI-SESS-81520B. Requirements set forth in the DO or TO take precedence over the information in this appendix.

Table I-1
Common IMDP components

Section	Title	Contains
Front matter	Cover Page	a. Course title. b. IMDP. c. Developer's name (and school, department, if applicable). d. Proponent. e. Date of preparation. f. Security classification marking, if applicable.
	List of Affected Pages	This table has two columns: a. Page number. b. Change in effect.
	Change Record	This table has four columns: a. Change number. b. Date. c. Title or brief description. d. Entered by.
	Foreword/Preface	Text description to include: a. Developer's name. b. Course title. c. Proponent. d. Contract number. e. Delivery order or task order number.
	Acronyms and Abbreviations	This table has two columns: a. Acronym or abbreviation. b. Meaning.

Table I-1
Common IMDP components, continued

Section	Title	Contains
Front matter (continued)	Table of Contents	Contains the page numbers for the information listed in this table.
	List of Illustrations	Lists each illustration's number, name, and page number.
	List of Tables	Lists each table's number, name, and page number.
Summary description of the courseware	Course Architecture	Text description that includes: a. Estimated number of course hours. b. Method(s) of delivery.
	Course Purpose	Text description to include: a. Course objective. b. Course skill level (entry-level, intermediate, advanced).
	Tasks Covered by Courseware	List the task numbers and titles in the sequence they will be covered.
	Target Audience and Training Prerequisites	Text description to include any MOS, grade, rank, and skill level restrictions.
	Security Classification and Distribution Restrictions	Text description.
	Foreign Disclosure Restrictions	Text description or write "None."
	Administrative Points of Contact	This table has five columns: a. Name. b. Title/organization. c. Address. d. Phone number. e. E-mail address. f. Include Army and developer administrative contact information.
	Simulated Equipment	List all equipment that will be simulated in the course or write "None."

Table I-1
Common IMDP components, continued

Section	Title	Contains
Summary description of the courseware, continued	Safety, Hazard, or Environmental Considerations	Text description or write "None."
	GFI/Course References	List all GFI and additional references used to develop the course.
	Copyright/Proprietary Materials Permissions	Text description or write "None required."
	Development Software Requirements	List to include: a. Product name(s). b. Version(s). c. Vendor name(s).
	IMI Hardware and Software Requirements	List to include: a. Operating system name and version. b. Any additional software, plug-ins, and their versions. c. Central processing unit type and speed. d. Minimum free system memory. e. Screen resolution. f. Sound card and speakers, if applicable. g. Types and numbers of disc drives, if applicable. h. Input devices. i. Output devices.
Course overview	Method(s) of Instruction	Text description to include: a. Instructional strategies. b. Instructor/facilitator involvement, if applicable .
	Course Map	Flowchart to include: a. Module names (if applicable). b. Lesson names. c. Branching (if applicable).

Table I-1
Common IMDP components, continued

Section	Title	Contains
	Courseware Flow Diagram	Flowchart of each lesson to include: a. LSAs. b. Branching (if applicable).
	Course Structure	Text description, list, or table to include: a. The TLO associated with each module. b. The ELO(s) associated with each lesson, when applicable. c. Estimated time for each module, lesson, and assessment. d. All usable SCOs from ADL-R and DAVIS/DITIS.
	Supplemental Materials and References	List (if applicable) to include: a. All materials. b. All references. c. An explanation of how students will access them.
	Assessments	Text description or table to include: a. Course completion criteria. b. Minimum passing score(s). c. Mastery pre-assessments. d. Post-assessments/PEs. e. Remediation process. f. Method of feedback.
Course overview, continued	Design Components	List the types of multimedia that will be used in the course.
IMI design specifications	GUI	If not using the standard Army GUI, write a detailed text description to include: a. Navigation icons (screenshot, function, and explanation of when they will be used). b. Text conventions. c. Buttons to access supplemental material.

Appendix J
Advanced Distributed Learning Registry (ADL-R)/Army Content Repository

J-1. Overview
Providing "anytime, anywhere" instruction is essential to maintaining military readiness in the information age. Soldiers must be highly adaptive to address threats quickly and effectively. The ADL-R and content repositories support military readiness by facilitating the discoverability and reuse of learning content for network delivery. Reusing content is cost effective and aids the rapid development of courseware. Figure J-1 illustrates ADL's six essential high-level attributes for all DL environments.

Interoperability: the ability to take instructional components developed in one system and use them in another system.

Accessibility: the ability to locate and access instructional components from multiple locations and deliver them to other locations.

Reusability: the ability to use instructional components in multiple applications, courses and contexts.

Durability: the ability to withstand technology changes over time without costly redesign, reconfiguration or recoding.

Maintainability: the ability to withstand <u>content</u> evolution and changes without costly redesign, reconfiguration or recoding.

Adaptability: the ability to change to satisfy differing user needs.

Figure J-1. Advanced Distributed Learning's (ADL's) high-level attributes for all DL environments

J-2. Department of Defense (DoD) community
The ADL-R is a content registry system designed, funded, and maintained by the DoD (see figure J-2). The registry allows registration of the existence, location, description, and other relevant properties of DL content developed and acquired by the DoD. Content repositories store the actual files. SCORM content packaging, which includes metadata, plays an important role, enabling advanced functionality for repository systems. Therefore, SCORM conformance is a requirement for all Army DL Web-based learning products delivered via an LMS. Metadata entered into the registry describes content packages stored in the content repository, much like a digital library. The registry acts as a digital card catalog. Registry searches result in a brief description of each entry, its metadata, and a link to the repository that holds it. For technical standards and guidelines, see the Business Rules, Best Practices, and Examples for Army SCORM 2004 Conformant Courseware. See appendix E. for SCORM courseware authoring approaches.
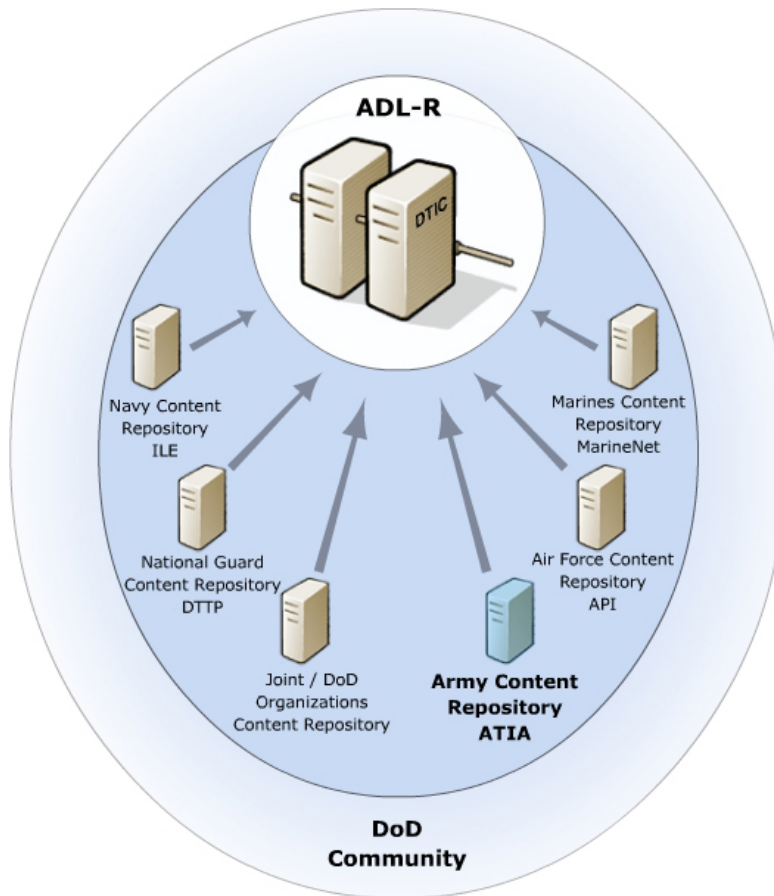
Figure J-2. ADL-R content registry system

J-3. SCORM-related definitions
Table J-1 contains common SCORM-related definitions.

Table J-1
SCORM-related definitions

Term	Definition
1. Army learning object	An XML file that is a required deliverable for content packages.
2. Content package	Content that is packaged in a known manner and file format, providing a consistent form for describing content structures, learning content, the metadata that describe the various components of the content structures, and sequencing and navigation rules.
3. Metadata	A searchable index of learning content metadata that points to its location in repositories.
4. Registry	A searchable index of learning content metadata that points to its location in repositories.

J-4. ADL-R
The ADL-R supports the DoD's learning communities. It enables the discovery and reuse of learning content held in repositories distributed across the DoD. The ADL-R is in its early stages of development and currently offers basic search functions with future services added upon resolution of policy issues. In time, it should also become a useful life-cycle knowledge management tool. DAVIS/DITIS are located at (http://www.defenseimagery.mil/index.html). DoDI 1322.26:

The ADL-R shall be searched prior to beginning any new distributed learning content development or acquisition to identify available content suitable for sharing, reuse, or repurposing, through minor revisions, as part of the formal front end analysis process. The Defense Automated Visual Information System/Defense Instructional Technology Information System (DAVIS/DITIS) also shall be searched for learning content in other media.

J-5. The Army's content repository
The CAR (formerly known as the RDL) is registered with the ADL-R content registry as the official repository for Army training/education and doctrine content. The CAR is registered with the ADL-R content registry as the official repository for Army training/education and doctrine content. The Central Army Registry (CAR) is located at [https://atiam.train.army.mil/catalog].

a. The CAR is maintained by the Army Training Support Center TRADOC Capability Manager for Army Training Information Systems.

b. To facilitate the Army's participation in the repository system, developers must produce content packages that are ADL SCORM-conformant, Army SCORM conformant, and include an Army Learning Object XML file. By searching the ADL-R, developers will be able to find content in the various DoD repositories for reuse or repurpose.

Appendix K
Compact Disc-Read Only Memory (CD-ROM) Production

K-1. Considerations for producing a CD-ROM
These considerations are based on issues and problems that occurred during the development of several multimedia courses. These considerations are listed in three categories to reflect the three different modes of production: general, Web version equivalent, and CD-ROM only. Apply the appropriate guidelines to any multimedia development placed on CD-ROM.

K-2. General considerations regarding CD-ROM production

　　a. Guidelines for courseware delivery. Develop courseware to run on the lowest level of hardware required to meet the requirement.

　　b. Distribution guidelines.

　　　　(1) Use multiple CDs if the data is more than 650 MB.

　　　　(2) Consider the target audience in this decision and the type of hardware likely to be used. CD-ROMs can be played on both CD-ROM and DVD players. DVDs can only be played on DVD players.

　　c. Licensing and distribution issues.

　　　　(1) Determine if any software packages (browser plug-ins, players, simulation engines, game engines, or retrieval software) are required to use the proposed CD-ROM learning product.

　　　　(2) Copyright agreements should be obtained prior to production. Copyrighted material should be identified. There should be no royalty or licensing fees.

　　　　(3) Have the software checked for presence of hardware or software plug-ins required to run the courseware, such as sound card, etc. If hardware is not present, inform the user and ensure the courseware still runs, even at a reduced performance. Provide the software plug-in on a CD-ROM for installation.

　　d. Guidelines for starting the program. Ensure:

　　　　(1) The user is provided the option of a shortcut, icon, or auto start to begin the program.

　　　　(2) The program can be run from any CD-ROM drive.

　　　　(3) The CD-ROM drive letter should not be hard-coded into the program.

　　e. Guidelines for optimizing files. Ensure:

　　　　(1) All files are compressed before making the CD-ROM.

(2) All unused clip files (sound, video, animation, still images) and resources (bitmaps, cursors, fonts, icons, menu bars, palettes, and shared script) are removed, using authoring system utilities.

(3) Graphic files are minimized so that a graphic that is larger than necessary for the method of delivery is not stored.

(4) All file names are unique (no redundancies).

f. Minimum capabilities of all CD-ROM applications. Ensure:

(1) Navigation between learning objects.

(2) Student progress tracking.

(3) Bookmarking.

(4) All student data is stored to a selectable storage drive.

(5) All required plug-ins to play the courseware are on the CD-ROM.

g. Requirements for "ReadMe" file. Ensure:

(1) The file is stored in the root directory of the CD-ROM.

(2) Alternative instructions for the student are included in the event the autorun feature is unsuccessful. These instructions should provide all of the information necessary for the student to manually initiate the CD-ROM courseware.

(3) There are launch instructions for the browser installation application and instructions to the student to "Accept all default installation options."

(4) There is a complete list of minimum computer hardware and software required to play the CD-ROM courseware.

K-3. Web-equivalent version of CD-ROM courseware

a. The file structure on the CD-ROM should match the directories and folders used in the Web version of the DL.

b. Special cases that do not require a Web version have additional deliverable and Army mandatory, metadata requirements:

(1) An archive file containing the complete offering must be created and submitted on a separate CD-ROM. This compressed archive file must be submitted to the Army repository for storage. Use the archive format specified in The Business Rules, Best Practices, and Examples for Army SCORM 2004 Conformant Courseware to create a single archive file.

(2) For reusability and discoverability, top-level metadata is required. This metadata provides information about the learning content and must be named "package.xml". The "package.xml" shall reside in the root directory and must be contained in the compressed file described above. Use the metadata specifications found in The Business Rules, Best Practices, and Examples for Army SCORM 2004 Conformant Courseware to produce this metadata file.

Note: This metadata file is not required to be on the "playable" CD-ROM version.

K-4. CD-ROM only version

a. Guidelines for directories and folders.

(1) Organize directories and folders as they will appear on the CD-ROM.

(2) Organize support files (video, audio, graphics, icons, executables, etc.) in subdirectories.

b. Guidelines for files.

(1) Keep all files that hyperlink among themselves in the same directory/folder.

(2) Keep media files (video, audio, etc.) in the same directory or in a subdirectory/subfolder.

(3) Include all setup files used to generate the CD-ROM.

(4) Include all support files (audio, video, graphic, help, etc.) used in the application.

(5) Include a list of the software needed to run the application in the "readme.txt" file.

c. Application installation. If the application requires installation on the user's computer, use these guidelines for installing.

(1) Check for sufficient hard-disk space, as part of the installation program. Notify the user if insufficient space is available and how much additional space is required.

(2) Download to the user's hard drive only those files required for proper operation (runtime software and multimedia drivers) and those to be updated (student records, student scores, and main course lessons).

(3) Establish a single location (directory) for all downloaded files.

(4) Check the latest version of media player and update player based on user's option.

d. Guidelines for uninstalling. A dialog box confirming or canceling the user's intent is required before removal of the learning product is initiated.

K-5. CD-ROM version artwork specifications
This paragraph provides the IMI artwork package specifications for CD-ROM labels, covers, and inserts to be used on the CD-ROM-based courseware. Submit artwork as part of a final package for mastering, replication, and distribution.

a. CD-ROM artwork. The labels, covers, and inserts for IMI CD-ROMs are replicated under commercial contract, using silkscreen and offset press processes. This requires electronic files that render type and color separations accurately, with templates created for the specific packaging required. For accurate replication:

(1) Fonts used by the printer, replicating the labels and inserts, must be the same version, name, and manufacturer as those used to create the artwork. Therefore, they must be supplied with the submission package. Embed all fonts within the artwork files. No custom-designed typefaces will be used. It is recommended not to use more than two fonts or typefaces for the artwork.

(2) Graphic images need to be 150-300 dots per inch in tagged image file format or encapsulated postscript format.

(3) Supply artwork containing color with cyan, magenta, yellow, black separations.

b. Labeling software. Create the artwork with professional desktop publishing, or illustration software, using the Windows operating system. Office graphics applications such as Microsoft PowerPoint and Word are not acceptable formats.

c. Submission requirements. Submission requirements for the master artwork package are:

(1) Three master CD-ROMs with labels.

(2) Printer dummy of the package, with covers (front and back) and insert, assembled just as the finished product will look.

(3) Electronic files placed on transportable media. The media must contain:

(a) Page layout file for each label, cover, and insert page, with fonts embedded.

(b) All graphic image files used to create the artwork.

(c) All fonts used.

(4) A printed proof copy, in color if used, of each electronic label, cover, and insert file, at 100-percent size.

(5) A printed directory of all files supplied on the transportable media.

(6) A completed U.S. Government Printing Office Form 952 (Desktop Publishing — Disk Information), for the replication package.

d. Packaging and inserts.

(1) Available CD-ROM packaging:

(a) Clear vinyl pocket (preferred choice), single CD-ROM, 5.25 by 5.25 inches, with rear cover single panel insert (4.274 by 4.75 inches printable), front cover flap to hold multipanel insert (4.274 by 4.75 inches printable), and fabric lining for CD-ROM protection.

(b) Cardboard sleeve, single CD-ROM pocket (5 by 5 inches), no flap, printable on two panels.

(c) Cardboard sleeve, single CD-ROM pocket, (5 by 5 inches), with front flap, printable on four panels.

(d) Cardboard sleeve, double CD-ROM pocket (double wallet, 5 by 5 inches), printable on four panels.

(e) Cardboard sleeve, single CD-ROM pocket (5 by 5 inches), with two double-thick panels and optional slits to hold second or third CD-ROM, printable on six panels.

(f) Jewel case in single, double, or quad.

(2) Insert choices:

(a) Single-page insert, 4.274 by 4.75 inches, printable on two panels (two sides of a single page).

(b) Two-page folded insert, 4.274 by 4.75 inches, printable on four panels (two sides of two pages), folded in half.

(c) Insert booklet, 4.75 by 4.75 inches, up to 32 panels (for both sides of a 16-page booklet).

K-6. General layout for CD-ROM labels and inserts
This paragraph explains the general layout for labels and inserts as a guide to show where and what to include. System requirements, user's guide instructions, etc., are expected to vary with each CD-ROM package developed. Clear vinyl pockets are the preferred packaging choice, because they are easier to mail, do not crack or break, and have a front flap pocket that can hold a combined front cover, user's guide, and rear cover in one multi-page booklet.

   a. CD-ROM label information. Refer to figure K-1 for text placement and requirements for a CD-ROM label. All numbers used are for illustration purposes only. The label for a CD-ROM containing unclassified material will be printed in black ink on white stock, without borders, set in a bolded sans serif font. If the CD-ROM contains classified information, the label will be printed in red ink. The following information should be included.
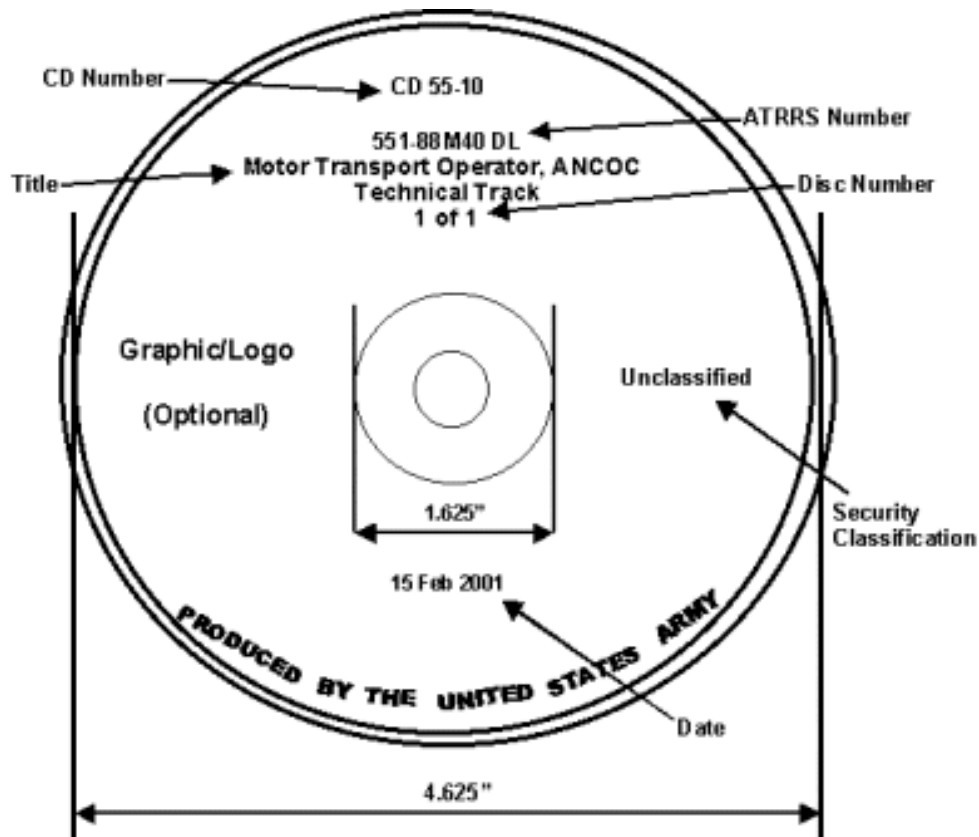
Figure K-1. General CD-ROM label layout

(1) CD-ROM number. The first centered line at the top of the CD-ROM will show the CD-ROM number. Each CD-ROM will have a separate CD-ROM number.

(2) ATRRS number or IMI unit training. The ATRRS number, if required, will be centered under the CD-ROM number. If it is only for unit training, use "IMI Unit Training" instead of the ATRRS number. If it is both part of a course and for unit training, center the ATRRS number first and place "IMI Unit Training" directly below.

(3) Product title. The title should be centered below the ATRRS number, or above "IMI Unit Training" at the top of the CD-ROM.

(4) Phase title/module number/lesson title/version. Indicate phase title, module number, lesson title, and version (if applicable) below the CD-ROM center, placed above the date.

(5) Classification. The classification will be to the right of the CD-ROM center. Place distribution restriction statement under the classification if other than unlimited distribution. If the IMI contains classified information, print the CD-ROM label in red ink. All classified IMI material will be safeguarded and handled according to AR 380-5, and TRADOC Supplement 1 thereto, and other DoD directives.

(6) Logo. An optional graphic or school logo may be placed left of the CD-ROM center.

(7) Date. Indicate the month and year approved for replication and distribution below the center hole of the CD-ROM. A version number or letter (for example, version A) may be placed next to the date, and separated by a comma. Indicate revisions as "Revised" followed by the date of the revision, on the same line as the course date, or the line below.

(8) Producer. The words "PRODUCED BY THE UNITED STATES ARMY" (in capital letters) will be centered at the outer edge of the CD-ROM, or straight across the bottom, below the date.

b. CD-ROM front cover information. Figure K-2 shows requirements for the CD-ROM front cover information. The front cover will also be the front cover for the user's guide insert.
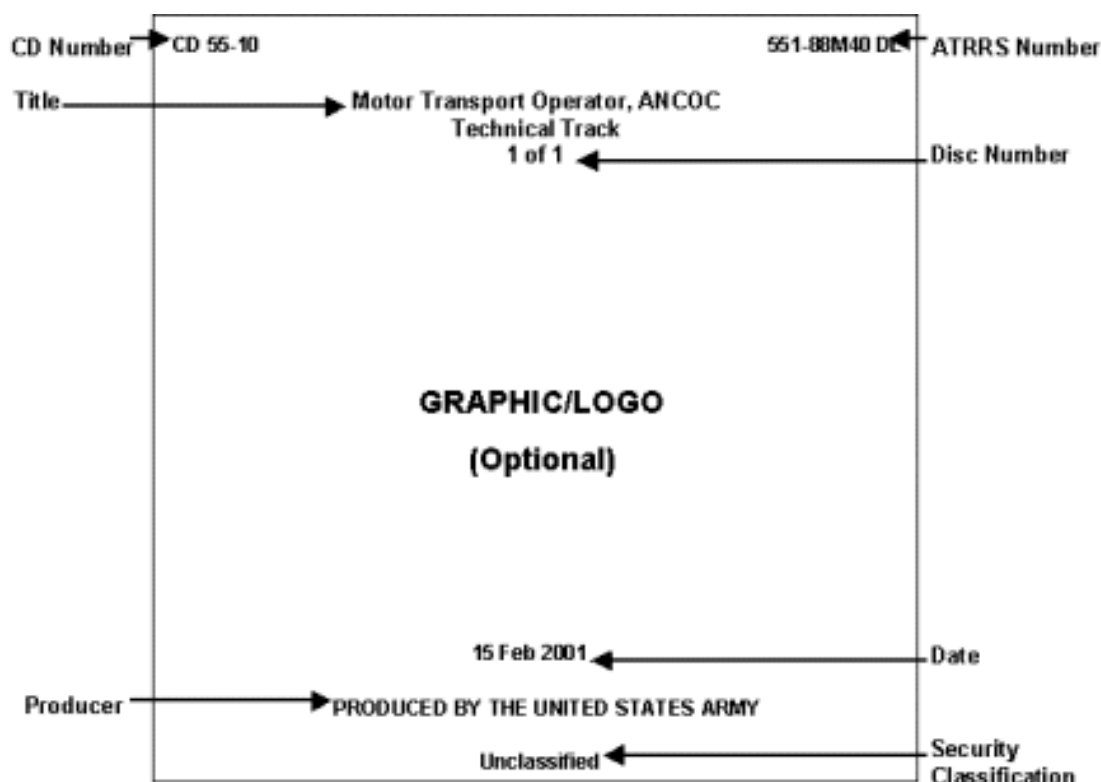
Figure K-2. CD-ROM front cover information

(1) CD-ROM number. The first line at the upper left of the label will show the CD-ROM number.

(2) ATRRS number. The first line at the upper right of the label will show the ATRRS number.

(3) Product title. The CD-ROM title will be centered in the upper third of the actual label. The title should not exceed four lines (short titles are preferred).

(4) Module/lesson title. The module and/or lesson title shall be below the CD-ROM title.

(5) Logo. An optional school logo may be centered on the cover.

(6) Date. The month and year of course approval will be indicated in the center, below the logo, and above the producer line. A version number or letter (for example, version A) may be placed next to the date, and separated by a comma. Indicate revisions as "Revised," followed by the date of the revision, on the same line as the course date, or the line below.

(7) Producer. At the bottom of the cover, centered above the classification, place the words "PRODUCED BY THE UNITED STATES ARMY."

(8) Classification. The classification level will be centered at the bottom. Classification level (secret or higher) will be printed in red. The applicable foreign disclosure statement will be placed above the classification, if other than unlimited distribution.

c. CD-ROM rear cover or jewel case tray information. Figure K-3 shows requirements for a CD-ROM rear cover insert for a clear vinyl pocket. The dimensions for a rear cover insert are 4.8 by 4.8 inches, with 4.274 by 4.75 inches printable. The clear vinyl pocket also makes a separate rear cover insert unnecessary, by allowing the information to be put on the rear cover of the user's guide insert. Eliminating the rear cover insert and putting the information of the user's guide booklet is preferred. Figure K-4 shows the information in the jewel case tray cover format. Include the following information.
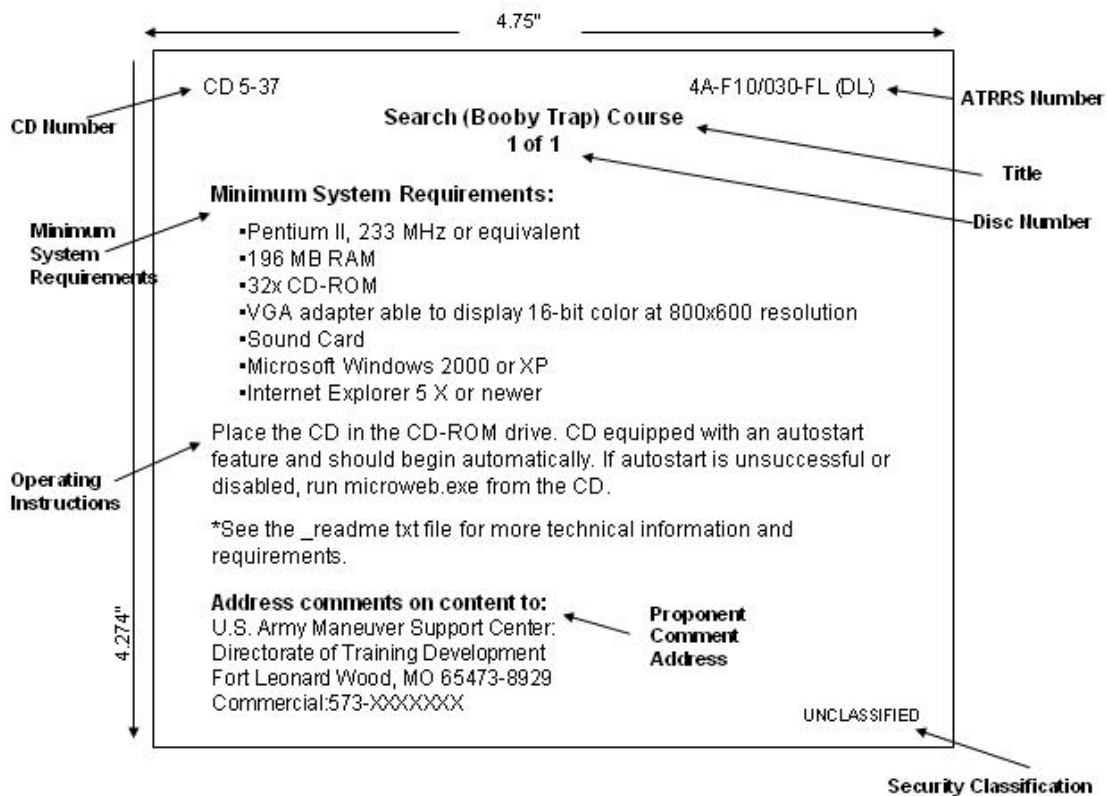

Figure K-3. CD-ROM rear cover information using clear vinyl pocket
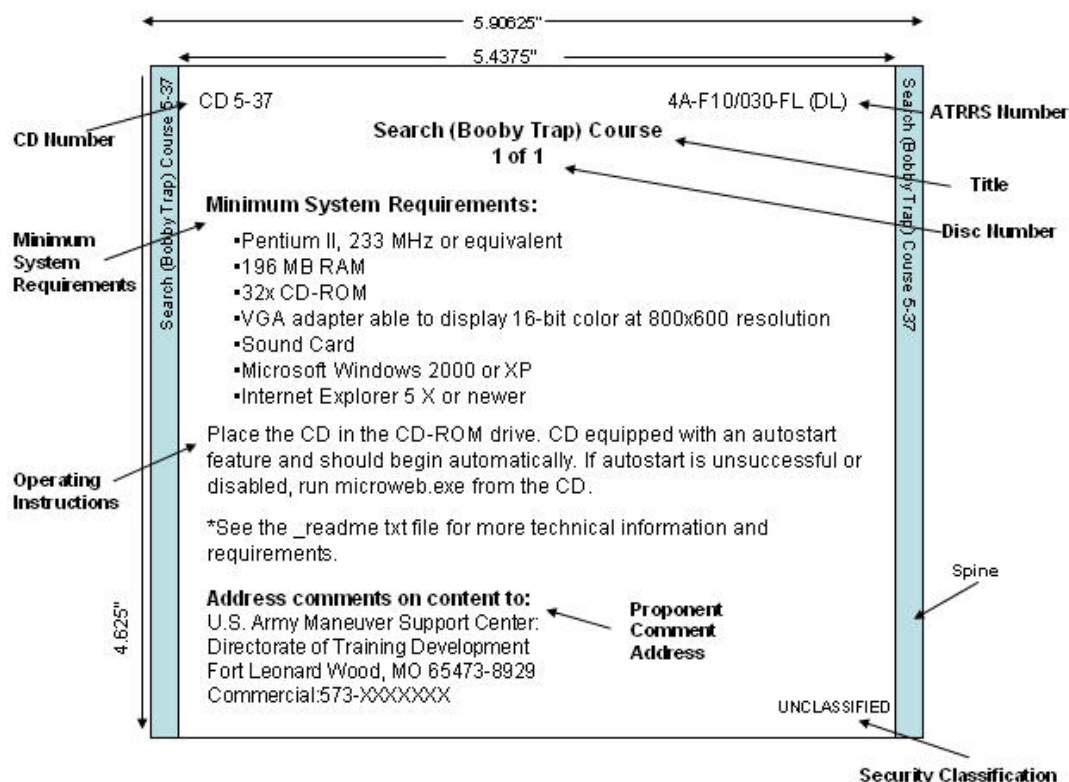
Figure K-4. CD-ROM rear cover information using jewel case tray cover

(1) CD-ROM number. The first line at the upper left of the rear cover will show the CD-ROM number.

(2) ATRRS number. The first line at the upper right of the rear cover will show the ATRRS number.

(3) Product title. The title of the CD-ROM will be centered on the line immediately under the ATRRS number.

(4) Recommended minimum system requirements. Identify minimum system requirements below the title of the CD-ROM. System requirements shall include the minimum and recommended software (browser, plug-in, runtime, etc.,) and hardware (sound card, graphics adapter, input device, synthesizer, etc.,) required to install and take the instruction on the CD-ROM.

(5) Operating instructions and installation requirements. Provide instructions as to how courseware is to be operated and installed, including how to use if autostart does not run.

(6) Comments addressee. Provide name and official mailing address of courseware proponent, to include an e-mail address. Indicate whether material is copyrighted.

(7) Classification. The classification level will be centered at the bottom. If the CD-ROM contains classified material, print the classification (secret or higher) in red.

(8) Spine. Indicate the CD-ROM title and CD-ROM number on each spine. Include the classification in red letters if secret or higher. A clear vinyl pocket case does not require spines.

    d. CD-ROM user's guide (back of front cover) information. Figure K-5 shows design requirements for a CD-ROM user's guide. The user's guide should not exceed 32 panels (for both sides of a 16-page booklet) to include front and back covers. The front cover will also be the cover for the user's guide booklet or insert.

Figure K-5. CD-ROM user's guide (back of front cover)

(1) CD-ROM number. The first line, at the upper left of the user's guide, will show the CD-ROM number. It will be opposite the ATRRS number.

(2) ATRRS number. The first line, at the upper right of the user's guide, will show the ATRRS number. It will be opposite the CD-ROM number.

(3) Identification of user's guide. The words "USER'S GUIDE" will be centered on the line under the CD-ROM number and ATRRS number.

(4) Instructions. Provide any information that helps the student in the use of this CD-ROM courseware to include:

      (a) Course objectives.

      (b) "How to" section.

      (c) User progress reports.

      (d) Assessment procedures.

      (e) Software installation.

      (f) Troubleshooting guide.

      (g) Other special instructions.

      (5) Troubleshooting. Use the following technical troubleshooting statement to assist users, if problems arise getting the CD-ROM to work, "For technical assistance, Monday through Friday, except holidays, 0730-1600 Eastern Standard Time, students may call the Army Training Help Desk at 1-800-275-2872 Option #1, or visit the ATSC Help Desk Web page any time at https://athd.army.mil/ (Web page access requires an AKO user name and password)."

      (6) Page numbers. Number all pages within the booklet insert, excluding the covers. Place the page number on the lower outside edge of the page. No page number is required if the user's guide is a single panel or page.

      (7) Classification. The classification level will be centered at the bottom. Classification level (secret or higher) will be printed in red.

Appendix L
Section 508 Standards

L-1. Software applications and operating systems

a. Keyboards. When software is designed to run on a system that has a keyboard, product functions are executable from a keyboard where the function itself or the result of performing a function is discerned textually.

b. Activate features. Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features, where the manufacturer of the operating system has documented the application programming interface for those accessibility features and they are available to the learning product developer.

c. Focus. Provide a well-defined, on-screen indication of the current focus that moves among interactive interface elements as the input focus changes. The focus is programmatically exposed so that assistive technology can track focus and focus changes.

d. User interface elements. Sufficient information about a user interface element including the identity, operation, and state of the element is available to assistive technology. When an image represents a program element, the information the image conveys is also available in text.

e. Bitmap images. When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images is consistent throughout an application's performance.

f. Textual information. Textual information is provided through operating system functions for displaying text. The minimum information that is made available is text content, text input caret location, and text attributes.

g. Display attributes. Applications shall not override user selected contrast and color selections, and other individual display attributes.

h. Animation. When animation is displayed, the information is displayable in at least one nonanimated presentation mode at the option of the user.

i. Color coding. Do not use color coding as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

j. Range of contrast levels. When a product permits a user to adjust color and contrast settings, provide a variety of color selections capable of producing a range of contrast levels.

k. Flashing elements. Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 hertz (Hz) and lower than 55 Hz.

l. Electronic forms. When using electronic forms, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.

L-2. Web-based intranet and Internet information and applications

a. Nontext elements. Provide a text equivalent for every non-text element via ALT or in element content.

b. Multimedia presentations. Synchronize equivalent alternatives for any multimedia presentation with the presentation.

c. Web pages. Design Web pages so that all information conveyed with color is also available without color, such as from context or markup.

d. Documents. Organize documents so they are readable without requiring an associated style sheet.

e. Server-side image maps. Provide redundant text links for each active region of a server-side image map.

f. Provide client-side image maps instead of server-side image maps, except where an available geometric shape cannot define the regions.

g. Data tables. Identify row and column headers for data tables.

h. Headers. Use markup to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.

i. Frame identification. Title frames with text that facilitates frame identification and navigation.

j. Screen flicker. Design pages to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.

k. Text-only pages. Provide a text-only page, with equivalent information or functionality, to make a Web site comply with the provisions of this part, when no other way is available to accomplish compliance. Update the content of the text-only page whenever the primary page changes.

l. Scripting languages. When pages utilize scripting languages to display content, or to create interface elements, the information the script provides is identified with functional text that assistive technology can read.

m. Applets and plug-ins. When a Web page requires the presence of an applet, plug-in, or other application on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with the paragraph above.

n. On-line forms. Electronic forms designed for completion on-line shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.

o. Links. Provide a method that permits users to skip repetitive navigation links.

p. Timed responses. When a timed response is required, alert users and give them sufficient time to indicate more time is required.

L-3. Telecommunication products

a. Nonacoustic connection point. Telecommunication products or systems, which provide a function allowing voice communication, and do not by themselves provide a text telephone (TTY) functionality, shall provide a standard nonacoustic connection point for TTYs. Provide the capability for users to turn microphones on and off to allow them to intermix speech with TTY use.

b. TTY signal protocols. Telecommunications products that include voice communication functionality shall support all commonly used cross-manufacturer nonproprietary standard TTY signal protocols.

c. TTY use. Ensure TTY users can use voice mail, auto-attendant, and interactive voice response telecommunications systems with their TTYs.

d. Time requirements. Voice mail, messaging, auto-attendant, and interactive voice response telecommunications systems that require a response from a user within a time interval, shall give an alert when the time interval is about to run out, and provide sufficient time for the user to indicate more time is required.

e. Caller identification. Where provided, make caller identification and similar telecommunications functions available for TTY users, and for users who cannot see displays.

f. Adjustable gain. For transmitted voice signals, telecommunications products shall provide a gain adjustable up to a minimum of 20 decibels (dB). For incremental volume control, provide at least one intermediate step of 12 dB of gain.

g. Volume. If the telecommunications product allows a user to adjust the receive volume, provide a function to automatically reset the volume to the default level after every use.

h. Wireless audio coupling. Where a telecommunications product delivers output by an audio transducer, which is normally held up to the ear, provide a means for effective magnetic wireless coupling to hearing technologies.

i. Interference to hearing technologies. Reduce interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) to the lowest possible level that allows a user of hearing technologies to use the telecommunications product.

j. Information transfer. Products that transmit or conduct information or communication shall pass through cross-manufacturer, nonproprietary, industry-standard codes, translation protocols, formats, or other information necessary to provide the information or communication in a usable format. Technologies which use encoding, signal compression, format transformation, or similar techniques shall not remove information needed for access or shall restore it upon delivery.

k. Mechanically operated controls. Products which have mechanically operated controls or keys, shall comply with the following:

(1) Use controls and keys that are tactilely discernible without activating the controls or keys.

(2) Use controls and keys that are operable with one hand and do not require tight grasping, pinching, or twisting of the wrist. The maximum force required to activate controls and keys is 22.2 newtons (5 pounds force).

(3) If key repeat is supported, ensure the delay before repeat is adjustable to at least 2 seconds. Ensure the key-repeat rate is adjustable to 2 seconds per character.

(4) Ensure the status of all locking or toggle controls or keys is visually discernible and discernible either through touch or sound.

L-4. Video and multimedia products

a. Caption decoders. Ensure all analog television displays, 13 inches and larger, and computer equipment that includes analog television receiver or display circuitry, are equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals. Effective 1 July 2002, wide-screen digital television (DTV) displays, measuring at least 7.8 inches vertically, DTV sets with conventional displays measuring at least 13 inches vertically, and stand-alone DTV tuners, whether or not they are marketed with display screens, and computer equipment that includes DTV receiver or display circuitry, are equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals.

b. Tuners and tuner cards. Ensure television tuners, including tuner cards for use in computers, are equipped with secondary audio program playback circuitry.

c. Captioning. Ensure all instructional and informational video and multimedia productions that support the agency's mission, regardless of format, that contain speech or other audio information necessary for the comprehension of the content are open (permanent) or closed-captioned.

d. Audio description. Ensure all instructional and informational video and multimedia productions that support the agency's mission, regardless of format, that contain visual information necessary for the comprehension of the content are audio described.

e. Selectable displays. Ensure display or presentation of ALT presentation or audio descriptions are user-selectable unless permanent.

L-5. Self-contained, closed products

a. Usability. Ensure people with disabilities can use self-contained products without requiring an end-user to attach assistive technology to the product. Personal headsets for private listening are not assistive technology.

b. Timed responses. When a timed response is required, ensure the user is alerted and given sufficient time to indicate more time is required.

c. Touch screens. Where a product utilizes touch screens or contact-sensitive controls, provide an input method that complies with the following:

(1) Use controls and keys that are tactilely discernible without activating the controls or keys.

(2) Use controls and keys that are operable with one hand and do not require tight grasping, pinching, or twisting of the wrist. The maximum force required to activate controls and keys is 22.2 newtons (5 pounds force).

(3) If key repeat is supported, ensure the delay before repeat is adjustable to at least 2 seconds. Ensure the key-repeat rate is adjustable to 2 seconds per character.

(4) Ensure the status of all locking or toggle controls or keys is visually discernible and discernible either through touch or sound.

d. Biometric identification. When biometric forms of user identification or control are used, provide an alternative form of identification or activation, which does not require the user to possess particular biological characteristics.

e. Auditory outputs. When products provide auditory output, ensure the audio signal is provided at a standard signal level through an industry standard connector that will allow for private listening. The product must provide the ability to interrupt, pause, and restart the audio at anytime.

f. Volume controls. When products deliver voice output in a public area, provide incremental volume control with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, ensure a volume gain of at least 20 dB above the ambient level is user selectable. Provide a function to automatically reset the volume to the default level after every use.

g. Color coding. Do not use color coding as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

h. Range of settings. When a product permits a user to adjust color and contrast settings, provide a range of color selections capable of producing a variety of contrast levels.

i. Screen flicker. Design products to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.

j. Freestanding products. Products that are freestanding, nonportable, intended for use in one location, and have operable controls, shall comply with the following:

(1) Determine the position of any operable control with respect to a vertical plane, which is 48 inches in length, centered on the operable control, and at the maximum protrusion of the product within the 48-inch length. See figure L-1.
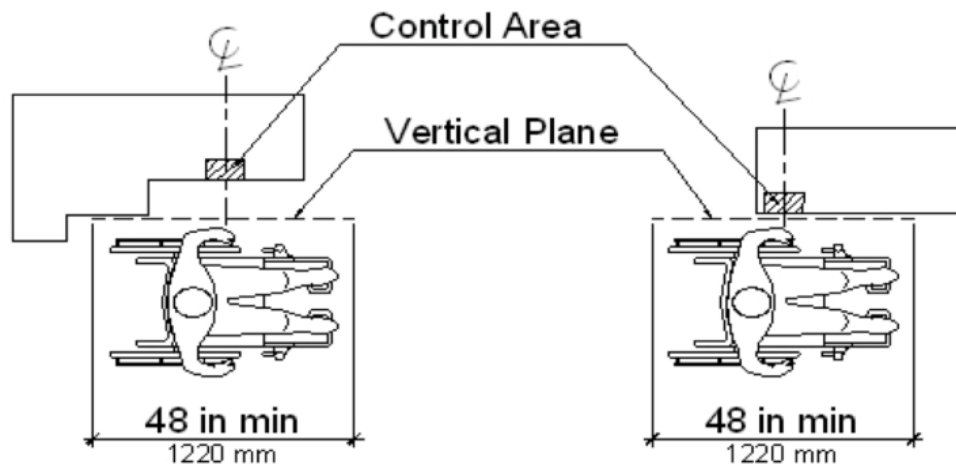
Figure L-1. Vertical plane relative to the operable control

(2) Where any operable control is 10 inches or less behind the reference plane, ensure the height is a maximum of 54 inches and a minimum of 15 inches above the floor.

(3) Where any operable control is more than 10 inches and not more than 24 inches behind the reference plane, ensure the height is a maximum of 46 inches maximum and a minimum of 15 inches above the floor.

(4) Ensure operable controls are no more than 24 inches behind the reference plane. See figure L-2.
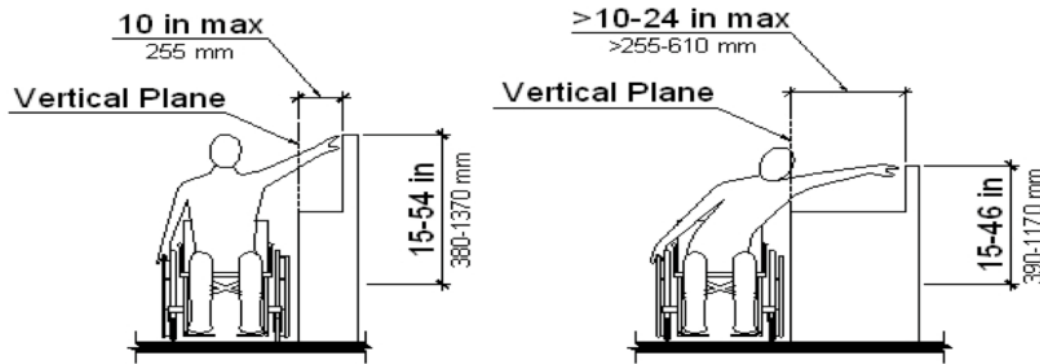
Figure L-2. Height of operable control relative to the vertical plane

L-6. Desktop and portable computers

a. All mechanically operated controls and keys shall comply with:

(1) Use controls and keys that are tactilely discernible without activating the controls or keys.

(2) Use controls and keys that are operable with one hand and do not require tight grasping, pinching, or twisting of the wrist. The maximum force required to activate controls and keys is 22.2 newtons (5 pounds force).

(3) If key repeat is supported, ensure the delay before repeat is adjustable to at least 2 seconds. Ensure the key-repeat rate is adjustable to 2 seconds per character.

(4) Ensure the status of all locking or toggle controls or keys is visually discernible, as well as discernible through either touch or sound.

b. Touch screens. If a product utilizes touch screens or touch-operated controls, provide an input method that complies with the above guidance.

c. Biometric identification. When biometric forms of user identification or control are used, provide an alternative form of identification or activation, which does not require the user to possess particular biological characteristics.

d. Expansion slots. Where provided, at least one of each type of expansion slot, port, and connector shall comply with publicly available industry standards.

L-7. Functional performance criteria.
The Access Board has established the following performance criteria:

a. Visual impairment. Provide at least one mode of operation and information retrieval that does not require user vision, or provide support for assistive technology used by people who are blind or visually impaired.

b. Visual assistive technology. Provide at least one mode of operation and information retrieval in audio and enlarged print output, working together or independently, which does not require visual acuity greater than 20/70; or provide support for assistive technology used by people who are visually impaired.

c. Auditory impairment. Provide at least one mode of operation and information retrieval that does not require user hearing, or provide support for assistive technology used by people who are deaf or hard of hearing.

d. Audio assistive technology. Where audio information is important for the use of a product, provide at least one mode of operation and information retrieval in an enhanced auditory fashion, or provide support for assistive hearing devices.

e. User speech disability. Provide at least one mode of operation and information retrieval that does not require user speech, or provide support for assistive technology that people with disabilities use.

f. Reach and strength limitations. Provide at least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions, and that is operable with limited reach and strength.

L-8. Information documentation and support.
Make product support documentation provided to end-users available in alternate formats upon request, at no additional charge. Ensure end-users have access to a description of the accessibility and compatibility features of products in alternate formats or alternate methods, upon request, at no additional charge. Ensure support services for products accommodate the communication needs of end-users with disabilities.

Glossary

Section I
Abbreviations

3-D	three-dimensional
ACOR	Alternate contracting office representative
ADDIE	analysis, design, development, implementation and evaluation
ADL	Advanced Distributed Learning
ADL-R	Advanced Distributed Learning Registry
AKO	Army Knowledge Online
ALCMC	Army learning and content management capability
ALM	Army learning model
ALMS	Army Learning Management System
ALT	alternate text
AR	Army regulation
ATHD	Army Training Help Desk
ATRRS	Army Training Requirements and Resource System
ATSC	Army Training Support Center
CAC	Combined Arms Center
CAD	course administrative data
CAPDL	Combined Arms Products for Distributed Learning
CAR	Central Army Registry
CBI	computer-based instruction
CBT	computer-based training
CD-ROM	compact disk-read only memory
COR	contracting office representative
CSS	cascading style sheet
DA	Department of the Army
DAVIS	Defense Automated Visual Information System
dB	decibel
DD	Department of Defense (forms)
DITIS	Defense Instructional Technology Information System
DL	distributed learning
DO	delivery order
DoD	Department of Defense
DoDI	Department of Defense instruction
DTF	digital training facility
DTV	digital television
DVD	digital video disk
E&IT	electronic and information technology
ELO	enabling learning objective
EPSS	electronic performance support system
ET	embedded training
FTP	file transfer protocol
GFI	government-furnished information

GFM	government-furnished material
GS	general schedule
GUI	graphic user interface
HTTP	hypertext transfer protocol
Hz	hertz
IAW	in accordance with
IMDP	instructional media design package
IMI	interactive multimedia instruction
IMS	Instructional Management Systems
IPR	in-process review
ISAP	individual student assessment plan
ITP	individual training plan
LCMS	learning content management system
LMS	learning management system
LSA	learning step/activity
MB	megabyte
MIL-PRF	military performance specification
MOS	military occupational specialty
N/A	not applicable
PD-DLS	program director – Distributed Learning System
PE	practical exercise
PWS	performance work statement
QC	quality control
ROCCE	Rapid Online Content Creation Environment
SCO	sharable content object
SCORM	sharable content object reference model
SME	subject matter expert
SOW	statement of work
TADLP	the Army Distributed Learning Program
TCM-TADLP	TRADOC capability manager, the Army Distributed Learning Program
TLO	terminal learning objective
TO	task order
TP	TRADOC pamphlet
TRADOC	U.S. Army Training and Doctrine Command
TTY	text telephone
USAR	United States Army Reserve
USC	United States Code
VTT	video teletraining
W3C	World Wide Web Consortium
WBT	Web-based training
XML	extensible markup language

Section II
Terms

Adaptive learning
Allows the student to tailor the learning experience. The student controls content and sequence, allowing full exploration and inquiry. The courseware uses hypertext and hypermedia to personalize the experience. Users have the ability to define their own learning goals, and to decide the learning steps or alternative paths to take.

Advanced Distributed Learning (ADL)
A developer and implementer of learning technologies across the Department of Defense (DoD). ADL employs a structured, adaptive, collaborative effort between the public and private sectors to develop the standards, tools, and learning content. ADL created SCORM and the ADL-R.

Advanced Distributed Learning Registry (ADL-R)
A DoD service that enables the reuse of content. Usable SCOs found via ADL-R will be provided as GFI. See http://adlregistry.adlnet.gov/.

Alternative text (ALT)
Text that describes and/or explains graphics and animations, for use when images are not being displayed.

Animation
The simulation of movement produced by displaying a series of successive images on the screen.

Army Learning Management System (ALMS)
A management administration system designed to track student performance over time, provide information concerning performance trends, record individual and group performance data, schedule instruction, and provide support for other learning product management functions.

Authoring
Using a software package (sometimes called authoring systems, authoring language, or authoring tools) to create courseware.

Authoring tool
In interactive courseware, software that allows an author to generate an instructional program without any explicit programming simply by specifying the instructional content and teaching logic. It combines the components of storyboards into a structured lesson with defined student interactions displayed via computer. It provides an actual lesson framework with an implicit or explicit teaching strategy.

Bitmap
File format that consists of a set of bits that represents a graphic image, with each bit or group of bits corresponding to a pixel in the image.

Blended learning
A mix of synchronous and asynchronous media and methodologies to best meet the instructional goal. A blended learning approach could be a DL phase and a resident phase, or it could be a Web-based asynchronous phase followed with a Webinar synchronous phase. The combination of collaborative and independent learning enhances the learning process. Blended learning allows you to take advantage of the strengths of both types of DL. Using blended learning

solutions for course design allows a wider range of options to find the right balance of resources, learning strategies, and technology.

Branching page
IMI page that contains hyperlinks in addition to Next and Back links that the student may visit.

Cascading style sheets (CSS)
Define how different elements (for example, headers, fonts, links, etc.) appear. A style sheet can be applied to any Web page, and a Web page may have more than one style sheet.

Client-side scripting
Scripts that must be downloaded and run on a local personal computer.

Cognitive task analysis (CTA)
A process of interviewing SMEs to gain information about all the actions and decisions required to successfully perform a task.

Collaborative learning
Allows people to come together to participate in discussion and group-based activities. Collaborative learning involves the joint construction of meaning through interaction with others. Collaboration can be divided into synchronous (instructor/facilitator involved) and asynchronous (self-paced).

Content
Text, visual, and audio elements of courseware.

Course map
A flowchart showing the sequences and relationships among modules and lessons in the instructional program.

Courseware flow diagram
Define lesson tasks with references, information frames or sequences, decision points, branching options, remediation, and other screen activities.

Defense Automated Visual Information System (DAVIS)
An online resource about visual information, audiovisual productions, and interactive multimedia instruction products able to support Army learning, command information, and operational missions. Usable SCOs found via DAVIS will be provided as GFI.

Defense Instructional Technology Information System (DITIS)
An online, unrestricted, full-text searchable standard DoD-wide database containing descriptions about proposed productions, productions in progress, and completed courseware products. Usable SCOs found via DITIS will be provided as GFI.

Delivery order (DO)
An order issued against an established contract where the terms, conditions, and unit prices are already set. A DO is the entry document into an already existing contractual mechanism that

clearly and completely defines the government requirement. It is the firm basis upon which the contractor can determine the nature, extent, and quality of the work required.

Development difficulty range
Rating scale used for production considerations; time and cost increases with the complexity of the graphic or animation (1 = easiest, 10 = most complex).

e-learning (asynchronous)
Instructional software, integrating a combination of text, graphics, animation, sound, and video delivered via the Web. The presentation may require active user interaction with the software in the form of questions, simulations, virtual reality, or games; or it may only require passive interaction to navigate through lessons. The student has control of location and pace of learning. Consists of Web-based learning products, online games, and simulations.

e-learning (synchronous)
Often called "virtual face-to-face." It is real-time communication where students interact at the same time in a virtual mode with the instructor/facilitator and/or with other students. It is collaborative instruction integrating a combination of the instructor/facilitator, other students, text, graphics, animation, sound, and video delivered via the Web. It may include instructor/ facilitator-led simulations and games or simulations and games played by multiple players at the same time. It may include collaborative software, chat, instant messaging, white boards, and file sharing, with possibly a combination of different methods being used. The instructor/facilitator controls learning and interacts with the students. The Soldier meets with the instructor/facilitator or other students in a collaborative forum using interactive desktop conferencing software.

Electronic performance support system (EPSS)
EPSS refers to applications designed to run simultaneously with other applications or embedded within other applications that provide support for the user in accomplishing specific tasks. An EPSS may provide needed information, present job aids, and deliver just-in-time, context-sensitive instruction on demand. A Web-based performance support system is an EPSS that uses Web technology to deliver support in an enterprise environment.

Embedded training
A function hosted in hardware and/or software, integrated into the overall equipment configuration. Embedded training supports training, assessment, and control of exercises on the operational equipment, with auxiliary equipment and data sources, as necessary. Embedded training, when activated, starts a training session, or overlays the system's normal operational mode, to enter a training and assessment mode. (AR 350-1)

Enabling learning objective (ELO)
A learning objective that supports the TLO. It must be learned or accomplished to learn or accomplish the TLO. It consists of an action, condition, and standard. ELOs are identified when designing the lesson. A TLO does not have to have ELOs, but it may have more than one.

Extensible Markup Language (XML)
W3C-recommended general purpose markup language that supports a wide variety of applications; assists in sharing data via the Internet.

Failing gracefully
Notifying the student that an error has occurred, and allowing the student to proceed.

File transfer protocol (FTP)
A communications protocol governing the transfer of files from one computer to another over a network.

Government-furnished information (GFI)
Information provided by the government to support contract development. This information includes documents, specifically instructional materials in print or data format, supplied to the contractor/developer before and during the execution of the contract. For example, if a proponent decides to contract out the development of a course, the proponent would provide the contractor with the analysis and design data as critical inputs to the development phase.

Granularity
Description of the components that comprise a system, referred to by size; large components are called coarse-grained granularity, and systems of small components are called fine-grained granularity.

Graphic user interface (GUI)
An interface for issuing commands to a computer utilizing a pointing device, such as a mouse, that manipulates and activates graphical images on a monitor.

Hotspots
Graphics or text with embedded hyperlinks, often used on branching pages.

Hypertext transfer protocol (HTTP)
A method used to transfer or convey information on the World Wide Web.

Independent learning
Self-paced; allows the students to study at their own pace. It provides just-in-time, anywhere, anytime instruction. The students are responsible for their own pacing, direction and location.

Instructional media design package (IMDP)
Contains the design documentation for the development and production of instructional media learning product materials.

Interactive multimedia instruction (IMI)
Loosely defined as computer-based technology integrating a combination of, but not limited to, text, graphics, animation, sound, and video. It predominantly applies to interactive, electronically delivered instruction and instructional support products. The term is used to describe a learning environment in which the instructional content prompts the student to interact by using mouse clicks and rollovers. The level of engagement varies based on the techniques used to display information, navigate, or branch. The interactive courseware component of IMI has been embraced in learning environments, because it combines the interactivity and management features of CBI with the benefits of realistic audio and video. IMI applications are developed in many forms, including tutorials, simulations, virtual reality, expert systems, Web-based or CD-ROM-based self-paced instruction, Web-based collaborative learning, and two-

dimensional personal computer-based simulations or games, as well as "just-in-time" instruction embedded in performance support systems. Refer to Military Handbook (MIL-HDBK) 29612-4A, DoDI 1322.20, and TRADOC Regulation 350-70 for more information.

Learning objective
A precise three-part statement describing what the student is to be capable of accomplishing in terms of the expected student performance under specific conditions to accepted standards. Learning objectives clearly and concisely describe student performance required to demonstrate competency in the material being taught. Learning objectives focus the learning product development on what needs to be taught and focuses student learning on what needs to be learned. Both TLOs and ELOs are learning objectives.

Media objects
Graphic, video, animation, and audio digital files.

Mouse over
See Rollover.

Network simulations
Designed to give students the experience of participating as elements in a simulation of a complex dynamic system. Participants operate from their own site in an open client-server architecture, which enables many users at the various sites to control the behavior of individual objects or agents and to view the aggregated results.

Path
The list of directories and folders where files are stored and the application searches for execution. A path may be:

    a. Relative: A path relative to the working directory; that is, only containing the subdirectories and folders under the directory the user is working in. Using relative file addressing, files that contain a hyperlink can be moved or copied, as long as the file structure within the working directory remains the same.

    b. Absolute: A path relative to the root directory. A hyperlink to a fixed file location is created, using absolute file addressing.

Picture Element (Pixel)
The basic unit of composition of a master image.

Plug-in
(In this document) a program added to a Web browser in order to add multimedia capabilities.

Productivity tool
A program that helps to produce or test courseware, particularly for SCORM conformance.

Protocol
A standard procedure for regulating data transmission between computers.

Repository
A storage device for digital information (content). Content proponents declare the existence of the data chunks in a registry for discovery and retrieval by others.

Rollover
A rollover is any object that changes in appearance when the user points to it or clicks it. Each appearance, or state, of a rollover is made with CSS and text, or may be made using different images. Four states can be used when creating a rollover: Up, Over, Down, and Over Down. Sometimes referred to as a mouse over.

Sequencing template
A fully functioning SCORM 2004-compliant content package which demonstrates a specific learning strategy.

Server-side scripting
Scripts that are run on a Web server.

Sharable content object (SCO)
A learning object representing the smallest unit of instruction. A learning object is any entity (digital or non-digital) which can be used, reused, or referenced during technology-supported learning.

Sharable Content Object Reference Model (SCORM)
Specifies a framework for content that meets the following requirements for Web-based content: interoperability, accessibility, reusability, durability, maintainability, and adaptability.

Simulation
Any representation or imitation of reality simulating part of a system, the operation of a system, and the environment in which a system will operate are three common types. There are virtual and constructive simulations

Splash screens
Opening page of each lesson. They usually contain similar visual and textual elements throughout a course.

Storyboards
Illustrations and explanations of the screens the student will see and how the student will interact and navigate through the application. They are a communication tool for the developers, programmers, graphic artists, and SMEs.

Task order (TO)
A contract document for ordering services contracts.

Terminal learning objective (TLO)
The main objective of a lesson. It is the performance required of the student to demonstrate competency in the material being taught. A TLO describes exactly what the student must be capable of performing under the stated conditions to the prescribed standard on lesson completion. There is only one TLO per lesson regardless of presentation method or media, and it

has only one verb. The TLO may cover one critical task, part of a critical task (a skill or knowledge), or more than one critical task. The TLO may be identical to the critical task being taught, or there may be a disparity between them. Where there is a disparity, it is the TLO standard that the student must achieve to demonstrate competency for course completion. See learning objective and enabling learning objective.

Streaming media
With streaming, the media (audio, video, and animation) starts displaying before the entire file has been transmitted, allowing quicker access to the instructions. Streaming technologies are becoming increasingly important with the growth of Web-based instruction.

Video teletraining (VTT)
VTT is a means of broadcasting to multiple sites through traditional television broadcast medium using live video and audio. VTT includes student participation in the form of two-way communication between personnel conducting the program and students located at remote sites. The instruction is usually in a discussion or demonstration format.

Viewer
(In this document) a software application that allows the user to view a file but not edit or manipulate it.

Web-based training (WBT)
WBT is individualized instruction delivered over computer networks and displayed by a Web browser. WBT is not downloaded CBT, but rather on-demand instruction stored in a server and accessed across a network. Web-based instruction can be updated very rapidly, and access to the instruction can be controlled by the training/education provider.

Web browser
A browser is an application that provides a way to look at and interact with all the information on the World Wide Web. Technically, a Web browser uses HTTP to make requests of Web servers throughout the Internet on behalf of the browser user.

Web-collaborative
Collaborative, asynchronous instruction loosely defined as computer-based technology, integrating a combination of text, graphics, animation, sound, and video delivered via the Web. It may include discussion boards, collaborative software, e-mail, animation, simulations, and games, with possibly a combination of different methods being used. The instructor/facilitator controls learning, makes assignments, requires postings, and provides discussion questions and feedback to the students.

Webinar
Seminar or instruction conducted over the World Wide Web. It is a type of Web conferencing. A webinar is 'live' in the sense that information is conveyed according to an agenda, with a starting and ending time. In most cases, the presenter or instructor/facilitator may speak over a standard telephone line, pointing out information being presented on screen, and the audience/student can respond over their own telephones. Collaborative software also adds many

additional features that can be used (chat, whiteboards, questions/polling, application sharing, etc.).

Wireframe package
An Army SCORM 2004-conformant content package; a shell/skeleton of a course that is the product of the sequencing and navigation strategy development process. Developers use it to test the functionality of the sequencing code before integrating that code with the instructional content; used by the Army to test.

World Wide Web Consortium (W3C)
An international consortium that creates Web standards and guidelines.

Section III
Special Abbreviations and Terms
This section contains no entries.